

PUBLIC WORKS DEPARTMENT REORGANIZATION COMMITTEE.

APPENDIX

TO THE

REPORT

OF THE

PUBLIC WORKS DEPARTMENT
REORGANIZATION COMMITTEE

VOLUME II.

MINUTES OF EVIDENCE

Taken at Bombay, Nagpur, Calcutta and Madras

WITH

APPENDICES.
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CALCUTTA
SUPERINTENDENT GOVERNMENT PRINTING, INDIA
1917

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PUBLIC WORKS DEPARTMENT REORGANIZATION COMMITTEE.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

PUBLIC WORKS DEPARTMENT
REORGANIZATION COMMITTEE.

At Bombay, Monday, 8th January, 1917.

PRESENT:

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KESHAW, K.C.B.

C. S. COBB, Esq., M.V.O.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member:—

R. J. KENT, Esq., Chief Engineer and Secretary to Government, Bombay.

D. G. HARRIS, Esq. (*Secretary*).

H. O. B. SHOUBRIDGE, Esq., M. I. C. E., Sanitary Engineer, Bombay.

Written Statement.

1. (I.) **Economy and suitability of methods of execution of public works.**—I am of opinion that the methods for the execution of civil works are economical, and in all respects suitable for the purpose for which they were devised, provided the officers and subordinates controlling the execution are themselves efficient. With inefficient supervision, or management, all systems are liable to failure.

2. (II.) **Encouragement of other agency.**—Where large contractors are available, their services are usually employed, but, outside Sind, there are not many really reliable firms of contractors available, except in large towns. If the services of contractors are to be more extensively employed, the rates will require to be generally increased because the present rates do not provide sufficient margin for contractors' profits. At present, piece-work contractors are extensively employed, and, as large contractors have to adopt the same system, the employment of large contractors requires that the rates should include the contractors' profits *as well as* the piece-work contractors' profits. I have, in the case of masonry dam construction, had enquiries made by European contractors, and they have never resulted in any work (except iron work) being taken up by them as the rates were insufficient to yield them any substantial profit. If firms without Indian experience are employed on large works they will, in my opinion, frequently find the work unprofitable, owing to their over confidence in the piece-workers employed by them and owing to their want of knowledge of the methods of execution which are most economical in this country. Provided all work, which is capable of measurement, is given out on piece-work, there should be no necessity to employ departmental labour on muster roll to any great extent. Where departmental labour is reduced to a minimum, the supervision required will be just as much in the case of large contractors as in the case of piece-workers. The only saving will be in "accounts."

Against this must be set off the great difficulty experienced in getting large Indian contractors, working on regular contracts, to remedy defects in construction or to remove faulty material. Their supervising staff is generally insufficient and insufficiently paid, rendering it necessary for the Department to give them indirect assistance, with trained establishment, without which works would not, unless of a simple nature, be rapidly and suitably carried out. Regular contracts in the Deccan frequently lead to disputes when the final bills come to be paid, particularly in cases where the margin of profit is low.

(2). There are frequently loopholes in the contracts or specifications, which render it possible for contractors to make claims, and to succeed in getting payment for them, when such payments were never contemplated in giving out the contracts. With piece-work contractors there is always a remedy at hand. As soon as any defects are noticed the contractor can be made to correct them, failing which his contract may be terminated then and there. I am of opinion that the piece-work system is more suited to the Deccan whilst in Sind, where the majority of the work is earth-work, large contractors can be successfully employed.

3. (III.) **Changes in organization.**—As I am extremely doubtful whether any changes are necessary in the organization of, and in the method of executing works by, the Public Works Department, I do not consider that any radical changes are necessary in the organization of the staff, beyond keeping the Department up to its full required strength by means of permanent appointments. Temporary appointments, except in the case of specialists, should be as few as possible.

4. (IV.) **Relations with other departments and sub-branches.**—I consider that the relations between the various sub-divisions in all branches of the Department are excellent, but that there is a tendency for some other departments to ignore the fact that engineering is a skilled profession which requires a special

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[Continued.]

training and that, where there is delay, it is not the fault of the Public Works Department itself, but is probably due either to the system in force or to the failure of other departments to set forth their requirements with sufficient clearness.

5. (V.) Decentralization.—This is undoubtedly desirable, and is steadily improving. It is a matter which has to be dealt with as special cases arise. I believe I am correct in thinking that the Public Works Department is decentralized to a much greater extent than many other departments in this country. Finance is the draw-back to thorough decentralization, and it is most difficult to devise methods of decentralization which are free from financial objections. It is a matter which might be left to the local Government to a great extent, but a step in the right direction would, I think, be made by reducing the control of the Government of India in some cases. Here again finance is the main difficulty, but I believe that the local Government should have larger powers in the way of altering details of designs of large works which will lead to economy in construction, or economy in upkeep, as also possibly in cases where the original designs are faulty. It is impossible to draw up large works which do not require numerous modifications when more detailed knowledge is obtained when construction has commenced. A step in the right direction would be to increase the provision made for error, or unforeseen items, considerably above 5 per cent. The increase thus made should be utilized solely with the sanction of the local Government, and more encouragement should be given for officers to effect savings consistent with good workmanship and design.

6. (VI.) Simplification of procedure.—This is a difficult question to answer, and as a rule the restrictions are imposed for reasons of finance. It is difficult

to remove restrictions which have been framed to meet a necessity which has actually arisen.

7. (VII.) Education.—I consider that the system of education in government engineering colleges is on a sufficiently broad basis to meet the needs of government and that the real attraction is, and must be, the scale of pay offered. In the lower paid posts I consider the education is possibly on too broad a basis, and more time might profitably be spent on practical engineering such as levelling, survey, classification of materials, measuring work, simple specification work and the like. Too much time may be spent by men, who will never rise beyond overseer, in obtaining theoretical knowledge, and in the study of engineering out of books, which they are unable to apply in practice. So long as the sole object of a student is to obtain a government appointment, irrespective of whether he has a taste for the work or not, no system of education for the engineering profession will produce many *fully* qualified engineers and architects. In addition to this the student, even from his early days, is not brought in contact with large engineering works to the same extent as the European student is. Again, manual labour of any kind is looked down upon by the student class, though there are now signs of improvement in this direction. I am unable to say whether the needs of private agency are met. If this refers to contractors my experience is that they do not employ trained men, and they expect government to provide the expert supervision.

8. (VIII.) Practical training.—There would be no objection to government permitting premium pupils to obtain practical training on government works, in cases where no private facilities exist for obtaining a suitable training elsewhere in India.

MR. H. O. B. SHOUBRIDGE called and examined.

9. (President.) The witness stated that he had served 22 years in the Public Works Department, but that the major portion of his service had been spent in the Irrigation Branch. His experience of the Buildings and Roads Branch had been limited to a few weeks in Belgaum. He had been Under Secretary, and was now Sanitary Engineer to the Government of Bombay. The only roads work he had done had been in connection with projects.

10. Taking the Public Works Department as a whole, he was convinced that the present methods were suitable and economical. He had no information as to how the rates paid for work executed by the Department compared with those paid by private contractors, but pointed out that the class and quality of the work had also to be taken into consideration in framing such a comparison.

11. He was unable to say how many contractors there were in the Bombay Presidency, nor had he any information as to their resources. He had worked with private contractors in the Deccan, but his experience had not been altogether satisfactory. In Sind, where the work consisted mainly of earth-work of a simple and straightforward nature, he had been more successful; but the Sind contractors were, in reality, merely a group of financiers who pooled the contracts between them and settled beforehand which ones each would take up. They were not "engineers" in any sense of the word—one firm consisted of a big local *zemindar* in partnership with a Shikarpur *bania*—and employed no engineering staff, but only *mistris* or *darogas*, who were not usually even craftsmen, but merely labour managers. He had never had any contractor under him who employed any engineering staff, nor had he even found one who kept a man capable of setting out his work himself. The large contractors sub-let their contracts, on the piece-work system, to petty-contractors. In other words, they employed exactly the same agency as the Public Works Department. As far as he knew, they seldom employed labour direct on muster rolls. His general rule was to call publicly for tenders and, if he failed to get a *pucca* contractor, to give out the

work on piece-work agreements, provided that it was susceptible of measurement.

12. The witness quoted the Darna masonry dam as an example. This work was $1\frac{1}{2}$ miles long and he had executed it by piece-work, the concrete costing only Rs. 18, and the masonry only Rs. 20 per hundred cubic feet. He admitted, however, that the work was undertaken some years ago, and that he was no longer able to obtain such favourable rates. A European contractor had come out to see the site of the dam before the work was set out, but, on being shown the plans, etc., had expressed himself as unable to work at anything like the rates offered and the witness had agreed that it would not be worth a big contractor's while to take it up. Hence no tenders were called for, and the work was carried out by piece-work.

13. He had employed a *pucca* contractor, the only one who came forward, when building the Chankapur masonry dam, as he had thought, in that particular case, that it was more satisfactory from the point of view, both of himself and government, that a regular contractor should be engaged. In the case of the Nandur Madhmeshwar wier, he had started on piece-work, but foreseeing early in the work that he could not do his masonry at the rates estimated, he had tried to get a contractor to undertake it. Only one man was willing to come forward and take up the work. This contractor had previously done some four miles of excavation of the canal satisfactorily, and the witness thought that he would possibly do the work better than he could himself, and so recommended him for the contract. This contractor, however, had proved to be an endless source of trouble in connection with his accounts, which, although the work was finished four or five years ago, had only recently been settled. He had great trouble in keeping the work going on satisfactorily, and he and his assistants had to order faulty material to be removed almost every day. He admitted that, in the abovementioned case, he had expected a contractor to undertake work at rates which he himself found insufficient, but he had thought that possibly somebody else might be able to do the work more econom-

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[Continued.]

ically than he could. They had always shown great consideration to contractors, especially if they could make out a good case for extra rates or other concessions. In the particular contract referred to there was a clause which laid down that any materials in the river bed must be removed before the floods arrived; otherwise the contractor could not claim for them. The contractor, however, left a large amount of materials in the river, and then claimed compensation because they were washed away. The witness forwarded the claim to government, and the Chief Engineer after inspection allowed the contractor half the difference between what he claimed and what the witness said he had lost, in addition to what the witness had already said he should get. This was purely a concession to the contractor and the Chief Engineer had made this clear to the latter.

14. Even if large contracting firms were engaged, the supervision charges would be just as heavy as they were at present with the class of contractor now employed. He was unable to say whether, if large contractors had their own engineering staff, the supervision charges would be reduced, but thought that, even in that case, when working on a long dam, the contractor would require careful watching. He had been employed for nine or ten years on the construction of masonry dams. In the case of the Darna masonry dam, which contained fifty-seven or sixty lakhs of cubic feet of rubble masonry and face work, he had had under him only one Assistant Engineer, two upper subordinates, and some few lower subordinates, possibly three or four. Even if a large contractor employed his own trained staff, he thought that just as large a government staff would be necessary, especially in the case of a dam where good work was essential.

15. It was very difficult to say whether his arguments applied to roads and buildings as strongly as they applied to irrigation. In the case of earth-work, for example, it was essential that all earth-work on irrigation works should be properly consolidated, and hence it required a great deal more supervision than, for instance, a railway embankment. He had seen cases on the Great Indian Peninsula Railway where three feet of metal had been laid under the rails because the banks had sunk.

16. Although the greater part of his service had been in the Irrigation Branch, men holding similar posts to himself could be given a charge in either branch in the presidency. He was not altogether in favour of the system in force in Bombay under which the branches were not separated, and engineers employed on irrigation work could be suddenly transferred to buildings and roads or *vice versa*. He was inclined to consider that complete separation into two branches would be preferable, but believed that the reason why this had not been done was that separation might involve the creation of extra districts which would possibly be uneconomical. In the presidency there was often a tank here and a tank there, and it was impossible to employ an irrigation Executive Engineer to look after a few tanks, which, under the present system, were in charge of buildings and roads men. Wherever there were large irrigation works there was a separate irrigation district. Some of the most important works were irrigation works, and hence the best men were very often kept on them, but he considered that if a man were not good in irrigation he should be given a chance in buildings and roads. In the converse case, in which a man who has spent a large part of his service in buildings and roads was sent to take charge of an irrigation district, he instanced one of his assistants, who had started in buildings and roads in Belgaum, and yet did well in irrigation later. He considered that the present system worked satisfactorily on the whole, so far as the Irrigation Branch was concerned, but, as that branch was somewhat more technical than the Buildings and Roads Branch, it was easier for an irrigation man to get into buildings and roads work than for a buildings and roads man to get into irrigation work, particularly in a case like Snid, where very special knowledge in regard to the silting of canals, etc., was required, and where the majority

of engineers had no buildings and roads work at all.

17. He had been Sanitary Engineer for just over three years. His qualification for the post was his experience of hydraulics as an irrigation engineer, and the greater portion of his present work consisted in water supply and drainage projects. As regards his experience before he became Sanitary Engineer, he had had one or two little works in connection with water supply, and such works were mainly applications of hydraulics. An irrigation engineer was equally capable of designing a water-works scheme. Drainage required rather more special knowledge, but water-works in India generally consisted merely of pipe lines and reservoirs, and such work could equally well be done by irrigation men; sub-soil water supply, about which he had not known much when he took up the post, was rather special, but he hoped that he now knew somewhat more about it. As Sanitary Engineer, he dealt with slaughter houses, beef markets, mutton markets and works of that nature in connection with municipalities. The designs were executed by the Sanitary Engineer and the main difficulty in such schemes was that of funds. He agreed that, in the case of a specialized appointment, it would be better to put in a man with previous experience of similar work, but hitherto no such officer had been available. He thought he was right in saying that only a few years ago there was, in Bombay, a single Sanitary Engineer without any staff under him at all, that officer's duty being merely to go round and advise. Subsequently, however, the scope of the Sanitary Engineer's duties was widened, and he was allowed to undertake the execution of projects in addition.

18. It would, he thought, be an excellent proposal, provided there was sufficient work, for sanitary engineers to be formed into a separate branch of the Public Works Department, that branch to be recruited direct from engineers who had taken specialized courses of training in sanitary engineering. At present he had two Executive Engineers under him, and a sub-division for Sind, and he anticipated that there would, in time, be plenty of work going on, but it took a very long time to get sanitary schemes sanctioned. He did not think, however, that there was sufficient work to justify him in supporting a proposal that so small a service should be recruited separately from the general Public Works Department branches. There was, in Bombay, sufficient work for the employment of a Sanitary Engineer with the three assistants he had mentioned. His branch was the first to have its expenditure cut down on account of the war and he had had to reduce his establishment on that account.

19. Besides being Secretary to the Sanitary Board, his duties embraced designing of projects and advising on sanitary matters. Although certain Executive Engineers of ordinary districts had expressed a desire to be allowed to prepare and execute water supply and drainage projects, he was not at all certain that such an arrangement was sound. In his opinion, all sanitary works should be under the Sanitary Engineer to Government, now that he had a staff capable of preparing designs and carrying them out. It was also very desirable that the construction of such works should rest with the Sanitary Engineer, who was the officer responsible for the project and who had acquaintance with sanitary matters. He was unable to agree that sanitary projects, when completed, should be made over to the Buildings and Roads Branch of the Public Works Department for execution. He thought it was feasible, in practice, to have a special staff engaged on the construction of sanitary works, although the latter were scattered over a large area. The number of such projects was limited, but a project estimated to cost Ra. 30,00,000 was under consideration, which would justify the formation of a special executive district. He was now trying to work out a list of good schemes, and to get them sanctioned, so that they could be carried out with the minimum of establishment when the war was over. One executive district could supervise two moderately large projects; say one costing Ra. 4,00,000, and one costing Ra. 8,00,000. The Sanitary Executive Engineer should have sub-divisional officers under him,

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[Continued.]

just as an ordinary district engineer had his sub-divisions. At present there were only three charges for the whole of the Bombay Presidency and Sind, and only one Sanitary Engineer for the whole presidency. This was an absurdly small allowance.

20. Drainage works required a certain amount of special knowledge, and water supply also was becoming specialized, as they were now going in for the bacteriological treatment of water, and hence his objections to the employment of ordinary Executive Engineers. He did not think there were any specialist sanitary firms in the Bombay Presidency, but there was one in the Central Provinces. That firm had come down to consult him about a drainage scheme which they were getting out, as they had heard that he was responsible for a cheaper scheme in Bombay, and they had admitted to him that the latter was extremely economical. There were, as stated, no private firms of sanitary engineers in the Bombay Presidency, but there were firms which were willing to take up sanitary work. He had, however, no personal experience of such firms. One firm of this kind were mainly iron-workers, but had undertaken a scheme for the drainage of Deolali. This scheme was being designed by them and the Military Works Services had asked him to go through the project and to advise them whether the arrangements proposed were suitable. He did not consider the firm to be sanitary experts or sanitary contractors in any way, and did not know whether they employed a sanitary expert in their office or not. They were, however, going to carry out this work as contractors.

21. One little fact, which he thought was interesting, related to the question of the employment of contractors on the class of work he had already referred to *viz.*, dam construction. The dams in connection with certain hydro-electric works were being constructed under the orders of a firm of consulting engineers at home, who were employing private contractors, but the same supply company had since decided to construct another masonry dam power project by the employment of piece-workers. He had given his advice in connection with the design of the hydraulic portion of the latter scheme, and the late Inspector General of Irrigation was joining the firm to supervise its execution. In the case of this masonry dam, the firm came to their present conclusion after experience of working with contractors.

22. It was a question whether there was sufficient work to justify the employment of more specialists in the Public Works Department. At present, the Sanitary and Architectural Branches were in the hands of specialists. He did not think that it was necessary to specialize bridge engineering, since the number of large schemes under this head was so small that it was not worth while employing specialists for them. As to whether a specialist was required in reinforced concrete work, he was not personally very fond of that material since it required closer technical supervision than could be provided at present. It might suitably be used in Bombay itself, where the Executive Engineer could see any part of his work every day, but he had seen work done in that material which he did not like at all, and some of which he would never have passed. He had not been connected with the work, but had merely seen it. He had even seen the construction of a bungalow, for a specialist firm, in which the foundations had been put in without any mortar.

23. As a Sanitary Engineer his work was mainly connected with municipalities, and he was trying to effect improvements in the methods adopted for the construction of public works in municipal areas. There should, he thought, be an engineer in every big municipality, and possibly an engineer for each group of smaller municipalities; thus Karachi and Bombay had their own engineering staffs, which were entirely self-contained and had no connection of any kind with the Public Works Department. These staffs designed their own projects, but government insisted on large schemes being sent up to them for approval. He had had the project for the Karachi water-works sent to him for opinion, but the reason might possibly have been that in that case loans or grants-in-aid were required for

the financing of the work. Municipal bodies in the Bombay Presidency were permitted to construct anything which they could pay for themselves, irrespective of cost: but the moment government rendered any assistance they could insist upon carrying out the work as a condition of its construction. In the case of water-supply and drainage works government had acted very liberally and were subscribing 50 per cent. of the cost of such projects as grants-in-aid, giving a loan for the remainder. A great many municipalities were rather glad of professional help as they had no staff of specialized sanitary engineers, the upkeep of which would be beyond their means. Many of them maintained a sanitary staff, but nothing more than a *mistri* in the engineering branch of it. Municipal bodies carried out their ordinary public works through the agency of their Chief Officer. Poona had an engineer who was, however, a subordinate, and who managed the repairs to roads. Smaller municipalities did not do much in this respect, although every town had its roads and a certain number of school buildings and municipal offices. With reference to schools, when a grant-in-aid was given, government might insist on doing the construction itself. Otherwise, he had only to pass the plans and was not concerned with the execution of the work.

24. He had had no experience to speak of in regard to district and local boards, nor had he gone into the question of the powers of these bodies. He was not concerned with local board works in Sind at all, except that he had once had to sign a completion certificate for a school built with mud bricks and plaster.

25. As to the internal working of the Public Works Department, he held the view that the control of the Government of India should be reduced. When he was Under Secretary, a large number of cases were always passing through his office which had to be submitted to the Government of India, and he thought that a reduction of this control would save a considerable amount of time on the part of the local Government; he realized, however, that the difficulty was to a great extent due to financial considerations. He could give no details as to what powers had recently been delegated to local Governments as a result of the recommendations of the Decentralization Commission, but certain cases had still to go to the Government of India, and he was of opinion that the supreme Government were tightening their control over big irrigation projects. He had had some experience in regard to excesses over estimates while engaged on those projects and thought, at the time when he was in charge of such works, that the Chief Engineer used to sanction a great deal more than he believed was now the case, even if he knew that an excess was probable. He believed that the control of the Government of India had been increased rather than decreased. He thought it probable that there had been excesses on some of the big irrigation projects, but was not certain of his facts. It was a point which he should possibly not have mentioned, but he considered that the delay which occurred in sending the details of sanctioned designs for the approval of the Government of India was in itself likely to cause an excess. He admitted that, as a general rule, he was allowed to incur an excess of 5 per cent., but thought that this allowance was insufficient and advocated that the local Government should be given power to incur higher excesses and that such excesses should be anticipated when the project was sanctioned. Five per cent. was always provided in estimates for unforeseen items, but he did not think that that was enough and would be prepared to recommend an increase up to 10 per cent., especially in the case of large projects which were really only finally worked up after construction had been started, when full information was for the first time available. Greater care was always taken in drawing up the final plans for construction, while very often project estimates were rough estimates based on areas of water-way or otherwise approximately arrived at.

26. He had attained the rank of Superintending Engineer only since he had been Sanitary Engineer to Government. He had certain powers as a Superintending

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Engineer, but he could not tell, without working in an ordinary division, whether or not they were adequate. He would be inclined to give Superintending Engineers all the power that could reasonably be given, but, although this would be an advantage, he did not think the effect would be very material. With regard to his experience as an Executive Engineer, he had no suggestions to make regarding the powers of those officers. He had exercised powers of technical sanction up to Rs. 500, but, when working on a big project costing over Rs. 20,00,000, he had had practically no power at all as his minor works formed part of the larger project which was beyond his powers of sanction.

27. There was an enormous amount of accounts work in the Executive Engineer's office but, personally, he considered that it was mostly very necessary. He had managed the accounts alright on his big works, but they entailed a great deal of labour as there was a vast number of papers which passed through with the accounts, such as bills, etc. It was always a difficult question in this country, but he would like to see the Executive Engineer freed from his accounts altogether as was the practice at home. He thought he was correct in saying that in England the Resident Engineer measured the work, and the bills were then handed over to the Accounts Department for payment. He would not, however, employ the present accounts staff, which was poorly paid, for that purpose. He was opposed to the suggestion that the compilation of the accounts should take place in a central office, each Executive Engineer merely furnishing his cash book, vouchers, and such other papers as were required for the compilation, as he had always been able to get the work done without difficulty. When employing piece-workers, he insisted on the bills being put through quickly. He used to keep a bill register of his own, which he believed had since been introduced as a standard form, and which was put up every week. He then went through all the bills in his office and, if any were delayed, he demanded an explanation. With this system in force he had never had complaints from his men that they were not getting paid. As to whether there were grounds for the complaint that the Executive Engineer was tied to his office by the large amount of accounts work which he had to do, particularly at the beginning of the month, he admitted that the Executive Engineer's more important functions were hampered, but was unable to suggest a remedy. The engineer must have some accounts to enable him to watch his expenditure. The maintenance of some form similar to the "Works Register" was essential on big works, but had not the same importance on small works. As to the objection that the engineer's time was taken up with the compilation of these accounts, although that officer had an enormous number of forms to sign which took him a long time, the actual compilation was done by the accountant and the accounts clerks, who were really responsible. The engineer could not possibly go into all the details, but he was bound to sign them. The desirability of transferring this work to a central office was a question mainly for the Accounts Department to answer. If that department were satisfied that they could do away with the executive officer's control, he considered that that course should be adopted; but he would leave the paying of the bills to the Executive Engineer, who should be responsible for seeing that they were not unnecessarily delayed. He stated that he had not found any difficulty in connection with the accounts rule which prohibited payments during the last days of the month. He used to make payments every day of the month, but he believed that payments made during the last few days were not included in the accounts of that month which were being compiled for submission to the Accountant-General. He admitted that he might be wrong as he had not been in executive charge for about four years.

28. The extraordinarily high proportion, (48 per cent.), of the expenditure of the Public Works Department placed under objection by audit, was probably mainly due to want of sanction to plans and estimates. On big projects the percentage of objections was very high, but

he had never had any very great number on small works. The Executive Engineer might be hampered to a certain extent by such objections, but he had never been worried by them except when they concerned works of importance. Some men, however, took personal exception to audit remarks.

29. In regard to the fact that the end of the financial year occurred right in the middle of the Public Works Department working season, he stated that, personally, he had found this rather convenient than otherwise and, as an instance, he stated that when the Darna dam was under construction the allotment given him had for some reason or another been cut down. As he could not afford to lose all the labour on the works he told the contractors that they would be paid out of the next year's allotment, and this had quite satisfied them. Further, he had always been ahead with his bills so the official year never bothered him at all.

30. As to whether he had any suggestions to make for the removal of restrictions that would improve the internal working of the Public Works Department, and increase its efficiency, he expressed himself unable to give any opinion off-hand. He thought that trouble was experienced in getting plans and estimates for small works sanctioned, but, in his opinion, these plans and estimates were really necessary.

31. He had had no experience of engineering education in this country, except that obtained by examining once or twice for the engineering college in Sind and for sanitary engineering. He had, however, had practical experience of the staff turned out from Indian engineering colleges, both upper and lower subordinates. This staff came mainly from the Poona College. He thought that the education provided at the Poona College turned out a very fair type of upper subordinate, if it were remembered that the native of India did not have the same opportunity from childhood of seeing engineering works. The students' ideas could not be broadened until a large number of big works had been seen by them, and he considered that the men he had got at present were improving every year, and that the class of subordinates was getting better. It was, however, true that natives of India were very fond of rushing to books, and it was difficult to get them to apply book knowledge practically. He would like to see an improvement in the practical training given to these students, but that, he thought, could only come in the course of time. As to his experience of the practical training of students appointed as probationers in the Public Works Department, he had only had one under him and that for a year or less. The training was satisfactory, but, in a case like the Darna dam, the probationer got practical experience of one class of work only. In buildings and roads, however, a probationer could go round and see a lot of different types of works. He was inclined to think that the theoretical training given to upper subordinates in the Poona College was really higher than was necessary for the work with which they were likely to be entrusted, but he had never gone into the question. He thought it possible that the standard of the theoretical part was too high and that of the practical part too low.

32. He was not prepared to express an opinion as to whether it was desirable that assistant engineers and upper subordinates should be trained in the same class and go through the same course. This was mainly an educational matter. He pointed out, however, that certain posts of assistant engineer in the Public Works Department were reserved for promoted upper subordinates.

33. It depended upon the number passing out whether or not it would be practicable to introduce a scheme under which all students (both those who had got government appointments and those who went into other lines) who passed out of Poona College should receive one or two years' training in the Public Works Department, but it would probably be practicable to give such training to as many as twenty-five. It was, however, very desirable that all passed students of engineering colleges should have the right to receive such a training, but these students would have to pick up things for themselves, and special time could not be spent upon them. When on the Darna

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dam he had had one man of this class and had told him what to go and look at, instructing him to come to him when in difficulty. He could not entrust such men with any responsibility, and it was not till they had had responsibility that they could be considered fully trained.

34. As to whether it was feasible for an Executive Engineer to control properly the training of one or two such men, he thought that it could be done on large works where the men could be looked after. In his opinion, if a system of practical training for students were introduced, government should insist on a premium, as there would be a great outcry from the engineering profession at home if no premium were enforced. There was no objection that he could see to government undertaking the training of pupils, provided no facilities existed elsewhere in private firms. Where, however, such facilities did exist, he did not think government should take up the training, unless it were made a part of the qualifications necessary for a degree. Where firms had works in India suitable for the purpose they, and not government, should take the pupils. He would be unwilling to make it a condition of contracts that contractors working under the Public Works Department should undertake the training of these pupils, if private firms did not take them, as contractors might reasonably object to be bothered with such restrictions. He thought work should be put first and training afterwards.

35. (*Sir Noel Kershaw.*) The work done on the Darna dam had been on piece-work and not at schedule rates. He merely put down certain prices for excavation and other classes of work. The English contractor he had referred to had spent a day with him in his office and had been shown the plans, etc., but had lost little time in deciding not to undertake the work. The project had been passed by government. He knew, however, the case of a scheme which had been taken up by European contractors who had stated that they had never seen the ground at all.

36. Government always wanted to know when alterations in plans were made, and when excesses were about to be incurred, and he thought that a bigger provision ought to be made for such changes at the start. It was undesirable to do this by putting on higher rates. Prices were rising every year, but the Executive Engineer was in most cases tied down to a fixed schedule of rates, although he himself never had such a schedule on irrigation works. He thought that a yearly rate book should be introduced, as was the case in England, but this would entail considerable work and would need a special man to see to it. He had never done work in England, but thought that something on the lines of this rate book would be of assistance if it were revised year by year. He was not sure whether, in some districts, the rates were based on schedules which had been in force un-revised for several years; he had never used a schedule of rates himself, so had never been tied down to one, but he thought that, in the Buildings and Roads Branch, there was such a schedule. He was also not sure whether, in examining projects, government paid any attention to the schedule of rates, as his experience had been mainly on irrigation works. Rates did not vary much in masonry dam works. At Bandardara the rates for masonry were thirty to thirty-two rupees per hundred cubic feet, but this was purely a question of the difference in "lead" of the material. The engineers themselves worked out the rates, and government had very little to guide them. The engineers endeavoured to show on the plans what was required with as fair an amount of accuracy as possible. They made a few borings when the project was under preparation, but it often happened that, when they came to the actual excavation, the rates were insufficient. As an instance, he cited the case of the Tata works where the preliminary borings showed good foundations all along, which was not the case when the work was opened up. In the case of masonry dams or reservoirs the local Government was able to estimate the cost within 10 or 20 per cent. From the financial point of view, the Government of India would be very annoyed if the difference between the estimated and actual cost were more than 10 per cent., and hence he did not think that

the margin for unforeseen charges was sufficient, but considered that government ought to be prepared to spend more if necessary. No one could tell beforehand what the actual cost was going to be unless an enormous amount of preliminary work was done which would be costly, take a long time, and probably mean a rise in rates in the meantime. He thought it was right that a project should be estimated to cost a certain amount, but the Government of India would be wise to add on 20 per cent. and then allow the local Government to work up to this. He did not think they made sufficient allowance for unforeseen items in the case of big works, such as a canal. Works varied according to their nature and character, and an addition of only 5 per cent. would probably be sufficient in the case of a building.

37. As to whether, from an engineering point of view, the construction of roads was a simple matter, he stated that in some ways it might be a very serious one, and that, if a bad alignment were selected, bad soil might have to be gone through which could have been avoided, and *nullah* crossings might be chosen which would make cross drainage works expensive. A highly trained engineer was not required for the construction of roads, but general supervision of detail was necessary. He had never been in charge of roads for long, so they had never worried him to any great extent. It took some time to select an alignment and to prepare the plans and estimates for the cross-drainage works, but when an Executive Engineer had once selected the alignment the construction could be done by an inferior class of officer. As to whether such work should be given to an Executive Engineer or a subordinate, he stated that there were other considerations which made this a rather delicate subject, but, personally, he did not think that it was advisable to entrust anything which involved much expenditure to a lowly paid subordinate.

38. (*Mr. Mackenzie.*) In sending up a project to government data in regard to the principal rates had to be given, and he had furnished such data in connection with the Bandardara dam. When he took over that work he calculated the necessary minimum rate for masonry, which included figures showing the price of carting, etc. He eventually got government to agree to raise the rates. He admitted that government maintained a schedule of rates in the Secretariat, and that if these were departed from they would probably desire to know the reason why. All his estimates for sanitary projects and water supply and drainage schemes within municipal limits had to be submitted to government after preparation, to be checked by the Chief Engineer.

39. With regard to the rates for sanitary projects he had to send a list of items to the local Executive Engineer, who returned it after entering the rates at which the work could be done in that particular locality. As Sanitary Engineer, government had tied him to these rates for his projects, and as far as he knew they made no allowance for a rise of rates.

40. He admitted that government insisted, in the case of dam construction, on a good percentage of borings and trial pits, but, even so, it often happened that the actual facts were misrepresented thereby. He cited the case of the Chankapur dam where borings were taken in a pool and where, during construction, it took a year to get down to the bottom of the foundations. The actual foundation was laid twenty or twenty-five feet below some enormous boulders which had previously been taken for hard rock. Foundation work was a part of his duties at the present time.

41. (*Rai Bahadur Ganga Ram.*) He was a Cooper's Hill man and all the big works he had undertaken had been done by piece-work. He did each individual portion by piece-work, as for example collecting *kanker* by piece-work, and paying the rate for bricks at the kiln site. He made his own arrangements for materials, and gave the contract for work to a petty-contractor. In laying masonry it was usual to give over the material to the contractor within a certain distance of the work, leaving it to the contractor to get the material on to the work. The quantity of mortar had to be watched, but he had

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never restricted the supply of it to any contractor in the case of a dam, as it was not safe, on work of that nature, to be too particular as to the quantity used. As to which of the three systems of piece-work in vogue in the Punjab he would prefer, viz. :—

(1) where the contractor finds his own labour and his own materials ;

(2) where government supplies materials only, and

(3) where government gives the contractor full rates, the contractor being required to take over materials of government manufacture ;

he stated that he adopted only two systems,

(1) where the piece-workers provided their own materials and were paid for finished work ; and

(2) where they were provided with materials for each individual portion of the work and had to put them together.

As to the third system, namely that under which the contractor had to purchase his materials from government, for big masonry dams in the Deccan he would most certainly insist that government should provide such materials as mortar and bricks which latter, however, were not very much used since bricks were not put into really first class masonry dams. In Sind, however, he had worked with contractors who burned their own bricks, put the work together, and were paid so much on the finished article. They were, of course, subject to supervision. The work in Sind was fairly simple and suitable for giving out to a regular contractor. The cost of the Darna dam was, speaking from memory, about Rs. 20,00,000 and the cost of the establishment was about 10 per cent. If he had made over the work to a skilled contractor he did not think that he would have been saved anything except that it would have obviated the trouble of keeping accounts. Close supervision would, however, have still been needed.

42. At the time of his appointment to the post of Sanitary Engineer he was the senior officer on the list for promotion to the rank of Superintending Engineer, and the post he now held was offered to him. He had previously applied for it, but he had had no experience of sanitary works in England and had never made a special study of sanitary engineering there. He had, however, seen works of this nature in England. He was carrying out some experiments on the Punjab system in connection with wells in Sind, and he had also works of the same character as the Ambala waterworks. In Bombay, however, water supplies were derived from sub-soil water, storage reservoirs and borings.

43. He did not know what the present rules were in regard to the limit above which accounts had to be kept by sub-heads, as he was no longer an Executive Engineer, but he thought that sub-heads were only dispensed with in the case of items costing less than Rs. 500.

44. Asked whether, in making out a schedule of rates, he allowed a margin for the piece-work contractor's profits, he stated that, when he started the Darna dam work, he had no idea how much the masonry was going to cost and had to discover the rates for himself as he went along. So long as he managed to get his labour he knew that he was paying a fair rate ; in general, the rate was directly dependent on the supply of labour, and when trouble occurred in obtaining the latter he had to raise the rates. Similarly at Chankapur he had not known what his masonry was going to cost. Piece-work tenders were sent to the Superintending Engineer for approval of the rates included therein. He thought that, on a big project, government ought to allow for an excess of 20 per cent. over the estimate. He had heard of cases of cent per cent excesses, but on the Darna dam he had had a large saving. He was not able to say how much his highest saving had been, but he had generally worked at somewhere about the estimated rates.

45. The contractor employed by him in Sind had supplied labour and burnt his bricks himself, but had had to obtain his limestone from the hills. He had employed him because it was the custom in Sind. The Sind contractors usually gave out heavy advances, and he thought the system was suitable so far as Sind was concerned. He had had piece-workers under him there also, when

on the Desert Canal. He had no reason to suppose that, if he had done the work himself, it would have cost less, but he believed that the rates had risen enormously since he was in Sind.

46. He had no specialist knowledge when he was appointed as Sanitary Engineer, nor had any of his three assistants.

47. He did not know whether any engineering firm in Bombay employed an expert sanitary engineer. If such a man were required he might possibly be obtained from among the engineers who worked for the Bombay Municipality.

48. As already stated, his accounts had never bothered him, although he always looked after them very carefully and watched rates and payments. He had been mainly employed on construction, and had always been ahead of his allotments, so was never rushed at the end of the year. He did not mind accounts. He had spent about a month on nothing but accounts in his early days at Karachi. Although he could not say that the system was perfect, it was helpful to him in some ways.

49. (*Mr. Kent.*) It was possible that, in the Buildings and Roads Branch, the Executive Engineer might be converted into an administrative officer. An Executive Engineer had a very extensive charge, not less than four, and generally about five thousand square miles, and had to maintain a large staff of subordinates.

50. He was under the impression that, in the case of repairs at any rate, Executive Engineers were tied down to their schedules of rates, which were not of very much practical use, as works were generally given out on rates varying by 5 per cent. each way.

51. He thought that engineering students, after leaving college, ought to pay a premium for receiving a practical training either from a big contracting firm or on government work. If private firms undertook this training, it would be worth their while to take some trouble over their premium pupils ; if pupils did not pay a premium such firms would probably not take the same trouble over them, and he considered that government should demand a premium for the same reason. He had never gone into the figures regarding the number of men turned out from the Poona College, but he thought that it was about twenty-five a year. In explanation of his statement that small buildings and roads works would not be of very much use for the practical training of students from the Poona College, it would, he thought, be difficult for the Executive Engineer to give them personal attention unless they were on big and concentrated works, but buildings and roads work, being very varied, would be extremely useful if personal attention could be given.

52. In a great many cases the executive officer was the same as the Chief Officer in municipalities in the Bombay Presidency, but he was not certain whether this was the case in Poona. While at Ahmedabad, he had sent in a recommendation to the Sanitary Board that the municipality should employ a thoroughly qualified engineer, and they had supported his proposal to government. The Municipal Commissioner for that town had also been of the same opinion, and the municipality had advertised and got such an officer. He was always willing to give assistance to places where no sanitary engineering staff was employed and the Public Works Department, in general, gave assistance to towns where there were no engineers. The Public Works Department had formerly carried out works on behalf of municipalities which had then no engineers ; in Poona, for example, government had done a great deal of work for the municipality. Some of the engineers now employed in the places referred to were practically only *mistria*.

53. He was not certain whether the Sanitary Engineer to Government had always been a member of the Public Works Department, but he believed it to be the case. If there were sufficient work to justify it he would advocate a separate branch of the Public Works Department for sanitary work, in the same sense as the architectural, mechanical and electrical branches were separate, and he considered that this would be possible in about twenty years' time. There was enormous scope for expenditure in sanitary engineering. In regard to recruitment

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for the branch, men trained in England had usually very little knowledge of Indian conditions and it would take them some time to get the experience they needed. This might possibly be a reason for not employing such men on sanitary works in India. The customs of the country counted for a good deal and they would know very little of them.

54. Asked whether he had been over the Tata works at Kandala, which had been given out to a firm of English contractors, he said that he had not examined them in detail but had seen only portions of them. A consulting engineer had been retained who drew up the project and employed contractors to execute the work.

55. Except for one European firm, who were mainly iron-workers but sometimes undertook sanitary work,

he knew of no sanitary engineering firm in Bombay. He did not know whether the Indian firm which carried out the drainage of the Agricultural College at Poona employed experts. He had seen this drainage work, but did not know anything at all about the firm. He did not approve entirely of the design of the work.

56. In regard to reinforced concrete work he had no objection to it provided it were properly watched. The difficulty of supervision in outlying places was a very serious one, and he was unwilling to acknowledge, definitely, that a specialist in reinforced concrete work was necessary, even if it were proposed that such an officer should remain at headquarters, and do all the designs in that material required for the whole presidency.

K. S. FRAMJI, Esq., Executive Engineer, Kolaba District, Bombay.

Written Statement.

57. (I.) **Economy and suitability of methods of execution of public works.**—The methods at present adopted for the execution of civil works in this presidency generally, and with special reference to the Kolaba district, are that most of the original and special repair works are let out by contract or petty-contract, as far as possible, and are executed by the contractor under the direct supervision of the Public Works Department staff; others, including current repair works, are carried out purely by departmental agency, either because suitable contractors are not available, or because it is more desirable to do them in that way. It cannot be gainsaid, and even the most biased critics would admit, that the works executed by departmental agency will compare very favourably as regards quality and efficiency with works executed by large contracting firms, and are far superior to works executed by private agencies or local bodies without Public Works Department supervision.

(2). With regard to the question of economy, the first impression likely to be created on a superficial consideration of the matter is that public works, executed by contract, are more economical than when done departmentally, but a more careful and deeper consideration would lead to the inevitable conclusion that this is true only to a limited extent and that under normal conditions the latter method is the more economical. In places where local labour is easily and readily available, works can be conducted by departmental agencies as economically as, or even more so than, by private agencies, for even if all works at a place or in the district are given to one contracting firm (this would, however, be undesirable and would not stimulate competition) the contractor will have to maintain a large establishment, and with the large percentage of profits he would expect, and very often the profits of a middleman as well, his rates would not be cheaper than departmental rates, which too involve establishment charges, but no profits. A concrete example will serve to bear out the above statement. Departmental agency would prove even cheaper than at present if the existing system of entertaining "works establishment" as temporary employees exclusively, is done away with. The economy effected, in pensions, by charging "works establishment" as purely temporary is, in my opinion, a false one, as the system results in giving to the Department some worthless, incapable and unscrupulous men, who have no sense of responsibility and take little or no interest in their work, as they know that the greatest punishment inflicted on them for bad and wrong work or behaviour is dismissal. They are the men who maintain "muster rolls" for labour, which is an account document of primary importance, as on it depends a very large proportion of the expenditure on a work. Their service, therefore, should in my opinion be made more attractive by offering to some, at least, of them employment on the permanent establishment and by extending to them the benefits, in regard to leave and pension, which are enjoyed by men in permanent government service. It is only then that this class of men could be made to feel the responsibility of their position and to work faithfully and with due

zeal and diligence, which would result in greater economy in the long run.

(3). But, on the other hand, in a district like Kolaba where the conditions are somewhat abnormal and labour is very scarce and unobtainable in several localities, works, preferably done by piece-workers or petty-contractors, result in greater economy as the piece-workers generally look after the works personally, and thus save themselves a large amount of establishment charges and are naturally content with small profits, as their investments are small. Another reason why works so executed prove economical is because the imported labour works at lower rates under piece-workers than under departmental agencies, due to the fact that they receive from them advances or daily payments, whereas in departmental works payments can seldom be made more than twice or thrice a month. It is, however, a matter of common experience to find that in districts like Kolaba contractors and piece-workers are unwilling to volunteer to take up works and they have to be induced to do so in many cases. In absence of competition the rates demanded are very high at times, and to encourage competition it is essential to create a sufficiently wide field of selection of well-trained men.

(4). In the case of repairs to, and maintenance of, roads and buildings, the introduction of purely private agencies for such kind of work cannot be advocated, as many of the items of repairs are generally of an indeterminate nature, while contract is a definite undertaking. There would, however, be no objection to giving out individual items of work on roads and buildings, e.g., collection of road metal, spreading and consolidating the same, white and colour-washing of buildings, etc., by petty-contract as is being done, at present even, to a great extent.

(5). In short, it may be remarked that it is a mistake to suppose that, compared to departmental works, the contract system must inevitably result in economy; it certainly does not lead to greater efficiency, but it possesses some advantages, the chief among which are that it sets free some establishment to look after and pay greater attention to maintenance and other works, and it simplifies accounts and control over expenditure, as it does away with the necessity of maintaining and auditing several account documents as "muster rolls," petty bills for materials and of piece-workers, etc.

58. (II.) **Encouragement of other agency.**—If it is contemplated to encourage large firms to take up works by contract, the cost of the works will certainly not be lower than if done departmentally, while the efficiency will deteriorate as in the *mofussil*, at all events, firms of standing would expect at least the whole work in one or more districts to be entrusted to them, otherwise the probability of such firms being established in small centres is very remote. Under such circumstances the firms would require to maintain as large an establishment as the Public Works Department does when conducting operations departmentally. This establishment would naturally look to the firms' interests and not to the interests of government, while supervision on works spread over a large area would require extensive and costly travelling. Hence, taking into consideration further

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the large profits which such firms would expect, works so done cannot be economical or efficient.

(2). On the other hand, the system now prevailing to a great extent in several districts of letting out a work or group of works to small contractors who personally attend to such works and do not require any large establishment, has many points in its favour to commend its continuance and perpetuation, but under somewhat improved conditions. It is a system which undoubtedly leads to economy if sufficient competition is forthcoming, and ensures efficiency in consequence of the close check and control which it is possible to exercise, as a sufficient staff of the Department is still maintained to look after the works. It would lead to still greater economy and efficiency if a sufficient number of trained and skilled contractors with sound professional knowledge and with the requisite resources at their command as regards men and implements are available, which is not the case at present in many districts; consequently competition is absent. Besides, the execution of works by contractors of the type ordinarily available requires the constant supervision of Public Works Department staff to give advice and to help the piece-workers to understand plans and specifications, to line out works, etc. Under existing conditions, therefore, it is neither possible nor desirable to entrust the construction of works solely to private enterprise without adequate supervision by the Department, as they have neither the knowledge nor the ability and means to carry them out unaided. It is highly necessary and desirable, therefore, to create both a supply and demand for private enterprise—the former by giving a suitable training at college and on works to men who wish to earn their living by contracts, and the latter by encouraging and patronizing men who have received such training in preference to mere capitalists, without the requisite training and knowledge. If duly qualified private agencies are thus forthcoming and established, works could be executed by them efficiently with much less supervision and guidance than at present, which means reduction in government establishment and consequent economy.

(3). To sum up, it would not be suitable to entrust public works in the districts to be executed by large contracting firms; this would neither be economical nor efficient; work, by petty-contract or piece-work, is suitable, economical and quite efficient; it could be made more economical by creating a class of trained men and inducing competition; while, finally, works executed departmentally are economical and very efficient, greater economy and efficiency being possible if the prospects of "works establishment" are made more attractive.

(4). With a view to relieving the Public Works Department of a portion of work done by it and other agencies it is suggested that the work of executing current repairs to government buildings, except perhaps residential buildings, may be conveniently entrusted to and executed by the heads of departments concerned, with due restrictions as to the amounts to be spent on them annually, as is the case at present, the expenditure being allowed to be accounted for by the Civil Department in their accounts, without reference to the Public Works Department. The buildings should, as at present, be allowed to remain in charge of the Public Works Department and to be inspected from time to time, with a view to make suggestions to carry out such repairs as are deemed necessary for the proper and due maintenance of the structures. The maintenance of such control is necessary as otherwise it is likely, that in the execution of repairs by the Civil Department, the conveniences of the Department will only be looked to in utilizing the grants of the buildings, the repairs essentially required for keeping the structures in good and sound condition, which is mainly attended to by the Public Works Department, being sacrificed and neglected.

(5). Besides, at present, the Executive Engineer of a district has generally to attend to a lot of local board work which, it is suggested, the board should be forced to do itself. For instance, such work as the reviewing of plans and estimates for petty-works like a well or a school house takes up much time of the subordinate estab-

lishment in visiting the sites in question, which may be situated in out-of-the-way places; again the preparation of projects for local board works which, for want of finances, may not be taken up for execution for at least ten or fifteen years thereafter causes a woeful waste of time of all concerned from the Executive Engineer downwards, which could be more usefully employed in various directions. To effect complete decentralization it would be necessary to get all local board work done by its own agency with an independent establishment except, say, works costing Rs. 10,000 and above. It is admitted that this would cause a certain amount of overlapping and interlacing of work, and a needless duplication of "works establishment," when works are carried out under two separate engineers within practically the same area, and to avoid this as far as possible it is recommended that, in addition to maintaining their own works and constructing works costing up to Rs. 10,000, the repairs of all government buildings outside headquarters of the district may be executed by the local board to whom the same percentage of establishment and tools and plant charges may be paid as is now levied by government for local board works. In that case it will not be necessary to assign the work of current repairs to buildings to the heads of departments concerned, as suggested above. Till such proposals are given effect to, I would suggest that the preparation of plans and estimates for all local board works costing under Rs. 5,000 and their execution should be done by them.

59. (III.) **Changes in organization.**—In so far as I do not recommend any great changes in the existing methods just at present, till the tone and conditions of private agencies are improved, except in the matter of assigning over works of current repairs to buildings to the heads of departments concerned, and in raising the limits of works to be executed by the local board, I do not think that any great changes in the organization are called for immediately except a slight reduction of the works establishment. But as conditions change and reach the stage outlined above, and when most of the original and special repairs works are done by contractors and piece-workers, it would be possible to reduce the number of sub-divisional officers and probably, to some extent, widen the areas of executive charges, more especially if the suggestions made to enforce on the local board the obligation of carrying out its own works is adopted.

60. (IV.) **Relations with other departments and sub-branches.**—The relations of the various sub-divisions of the Buildings and Roads Branch are all that could be desired, and where any differences arise the engineers who are the respective heads of the sub-divisions can be left to themselves to satisfactorily solve them by a give and take policy.

(2). The relations between the Public Works Department and other departments are on the whole satisfactory and cordial, but instances are not wanting in which members of the Civil departments interfere in matters of purely professional and technical nature, with the result that protracted correspondence unnecessarily ensues and considerable delay arises in the execution of works. There should, therefore, be distinct rulings on the subject, prohibiting such interference. Besides, if public funds are to be utilized to the best advantage, the independence of the Public Works Department must be strictly maintained and any attempts to subordinate it, even in a remote degree, to the Revenue Department (like the Forest, Police, etc.) must be guarded against.

(3). Further, the prestige of the Department should be restored to its former level by abolishing the provincial service of engineers, the unfortunate creation of which has lowered the prestige undoubtedly to a great extent, and by maintaining only one service namely of Imperial service engineers as was the case prior to 1892.

61. (V.) **Decentralization.**—Further decentralization in the Public Works Department itself would appear desirable by giving new or increased powers in the following respects:—

(a) the sub-divisional officers may pass requisitions for petty stores required for current repair works provided

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the materials are included in a schedule of rates which has been previously approved by the Executive Engineer ;

(b) Executive Engineers may be given more latitude in the matter of local purchase of articles of European manufacture, the rules in force at present are unduly rigid ;

(c) Executive Engineers may be delegated with powers to accord technical sanction to original works up to a limit of Rs. 5,000, and to accept tenders up to Rs. 10,000 ;

(d) Executive Engineers may be authorized to appoint temporary upper and lower subordinates against posts and within the scale annually sanctioned by government, as also to grant sub-divisional allowances, to the extent of the sanctioned scale for the district, to the subordinates they consider most deserving, without reference to the Superintending Engineer ;

(e) Executive Engineers may be given the power of sanctioning rents of government buildings, now sanctioned only by Superintending Engineers, as the rent statements are prepared according to established rules and there is very little audit.

62. (VI.) *Simplification of procedure.*—If efficiency and economy in the execution of works are to be aimed at, no changes appear necessary or would be desirable to be made in the provisions of the Public Works Department Code, which are not unduly restrictive, except as regards transferring the work of executing current repairs of government buildings to the heads of the departments concerned or to the local boards, as suggested above.

63. (VII.) *Education.*—In a book entitled "Engineering as a Profession" by A. P. M. Fleming and R. W. Bailey (John Long Ltd., London) the authors speaking of the Roorkee Civil Engineering College have said "The training afforded at this college is of a very high order and probably unequalled in suitability for civil engineering work in India by any college in this country." Further, a very competent authority, a retired Chief Engineer of the Punjab, is also reported to have given his opinion that as far as engineering courses at London University, City and Guilds, Bristol, Manchester, Oxford, Glasgow and other places in England could be compared, he found on careful comparison of examination papers set in the above institutions with those of Roorkee College that the latter were as good as the best and better than the rest.

(2) What is true of the Roorkee College is equally true, in my opinion, of the Poona College of Engineering which of late years has been expanding its sphere and scope of work so as to impart a thoroughly sound and advanced training, theoretical and practical, in the various branches of civil engineering (roads, railways, irrigation, water-supply, sanitary engineering, etc.), as well as in mechanical and electrical engineering. The college has been lately provided with a large and well-equipped engineering laboratory which can challenge comparison with those of similar institutions in Europe and America and in which laboratory courses are imparted in applied mechanics (testing of materials) and in experimental engineering involving the details of construction and working of various appliances in mechanical, hydraulic and electrical engineering. There are also proposals now being put forward before the Senate of the Bombay University of extending the advanced civil engineering course to four years, which will eventually separate out at a certain stage the courses which engineers and upper subordinates will undergo. These new proposals, which will probably take effect before long, provide for examinations which include, besides written papers on all subjects of civil engineering, mathematics and science, practical examinations in physics, chemistry, surveying, mechanics, prime movers and hydraulics as also in the preparation of engineering projects from given data. The minimum laid down for securing a pass in each of these practical examinations is 40 per cent., while in the final examination the percentages required for securing an ordinary pass and a first class are as high as 45 and 65 respectively. These courses are, it must be admitted, very comprehensive and advanced, and the tests of such a high standard as will compare very favourably with those of many other engineering colleges in the advanced countries of the world.

(3) In the other Indian colleges of engineering the training and standards are almost of the same high order, so it may be safely asserted that the system of education in all government colleges is organized on a sufficiently broad basis to meet the demands of government and other local bodies as railways, municipalities and native states ; and that, while there is nothing to complain of at present, there is every likelihood that in the future the best possible candidates will not be attracted to the colleges unless the prospects held out are considerably improved and measures are adopted to give local talent a full opening for development. Besides, speaking more particularly of the Poona College of Engineering, the admission to the college is at present restricted to about 50 men each year (including students from outside presidencies) and though preference is being given, in the matter of admissions, to students of high academical qualifications, it has been found in practice that many aspiring and deserving youths do not get admission to it, so that till this difficulty is removed a sufficient number of trained men will not be available and the field of selection of private enterprise will not be sufficiently wide. The college at Poona requires to be enlarged or one more college provided ; besides, in order to continue to draw the best available local talent to the profession, the total recruitment of engineers from Indian colleges into government service should be substantially increased and the conditions of service made as attractive as they were prior to 1892 when the provincial service, with its degrading conditions, was organized ; otherwise professions more remunerative would attract the pick of local talent.

(4) The one defect with the system of education is that there are no specialized courses and all students are indiscriminately trained in all branches of engineering ; it is practically a waste of time and energy to train men in all branches and to employ them exclusively in one particular branch as Irrigation, Railways, etc.

(5) Besides, the present system of education imparted will not, unless suitably modified, meet the requirement of the future engineering profession as now contemplated, since it does not cater for the class of students who may wish to settle down in life as contractors. It would be easy for the college authorities to arrange for a course to meet such requirements in which such superfluous subjects as higher mathematics, science and advanced portions of engineering may be dispensed with and a simpler but more practical course in civil engineering and partly in mechanical be substituted, with an advanced course of workshop practice in filing, chiselling, turning, casting, dressing of stones, etc. A special college diploma may be granted to such students. We shall then have a class of trained and qualified men who would be quite capable of conducting, efficiently and economically, works by contract without such supervision or guidance, and who should be encouraged to take up works in preference to the present type of so called contractors. It is but natural that only sons of persons having some private means would join such classes.

64. (VIII.) *Practical training.*—So far as the Bombay Public Works Department is concerned—and I believe the same is the case in other provinces also—adequate provision has been made of late years for the practical training of students who pass out of the Poona Engineering College and obtain the government guaranteed appointment as apprentice engineers. During the year of apprenticeship they are posted on different large works under construction and are required to take notes, with necessary sketches, regarding details of construction, management of labour, manufacture of materials, etc. ; these notes are submitted for inspection and remarks to the Principal, College of Engineering, through the Executive Engineer and Superintending Engineer of the divisions. This ensures the apprentice engineer undergoing a thoroughly practical training in the work he has to do in future, and it would greatly add to his general knowledge and usefulness if, after a service of 5 or 6 years in this country, he is made to undergo, with a view to specialization in any particular branch he or government may select, a year's further training in the countries

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which can impart the best training in that branch of engineering as Europe, America, etc.

(2). Similarly, in the case of Europe-trained engineers who are admitted into the Public Works Department in India, they should be made to undergo a year's training in Europe before coming out to India and a further year's training on works in India in the special branch selected.

(3). For the rest of the students that pass out of the Indian engineering colleges, I would recommend that such

of them as are willing and signify their intention may be given a year's practical training on works by being placed in small batches under different Executive Engineers of districts where works of importance are under construction. Similarly, all the students who have undergone the particular course of training suggested above for the contractors' class should be forced to go through such practical training for a year or even two years before the diplomas are finally granted to them.

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65. (President). The witness stated that he had had nearly 20 years' service in the Public Works Department, that he had been trained at the Poona Engineering College, and that he belonged to the provincial service. He had served for two years in the Irrigation Branch, had been a professor of civil engineering for three and a half years at the Poona College, and was now an Executive Engineer in charge of a buildings and roads district.

66. He had had no personal experience of work, either for government or otherwise, done by large firms of private contractors, but he had heard about them, and he cited the case of the Tata works where a masonry dam was being constructed by a contracting firm. No extra efficiency had been obtained by this method nor was any less establishment employed than would have been the case had the Public Works Department executed the work. He thus confirmed what he had stated in his written evidence that there was not very much scope for change in the system adopted by the Public Works Department, under which works were constructed with fair efficiency and economy. He did not, however, know anything about the rates on that particular work, nor was he able to give any information as to how the rates of private contractors compared with government rates. With regard, however, to the establishment employed, he knew for a fact that the engineers employed by the contractors were much more highly paid men than those employed by the Public Works Department.

67. Very few buildings were constructed by private agency for private purposes in his own district of Kolaba, nor did he think that there was much work of importance done in the *mofussil* generally either by private agencies or district boards, except perhaps a building such as a *dharamsala* or a school house, etc., here and there. Except in large central towns private requirements in the majority of districts in the Bombay Presidency were extremely limited, and there was very little work to be done other than government work.

68. The present Public Works Department system might, he thought, be improved by the employment of permanent instead of temporary establishment on works. At present, almost the whole of the establishment employed in the direct charge of works was purely temporary, even to the office clerks in sub-divisions. All members of the works establishment except those up to and above the rank of sub-overseer were temporary men. At times there were even sub-overseers who were work-charged and temporary. It was the works establishment, namely the *karkun* and the *mistri*, who were responsible for getting the work done, and when there were no original works under construction these men were employed on the maintenance of buildings and roads. This establishment was engaged by the Executive Engineer and its cost debited to the work, provision for the same being made in the estimates by inclusion in the rates. In addition to such ordinary establishment, there was a further establishment which was employed by the Public Works Department, wherever necessary, on the supervision of new or original works, the cost of which was included in the rates for the work. The percentage allowed for the cost of works establishment on the cost of the works was about 4 to 5 per cent. He himself did not allow more than this amount, special subordinates being employed to look after larger works. At least a portion of this works establishment should be made permanent in order to increase their probity and efficiency.

69. There was, except occasionally, hardly any work in *mofussil* towns suitable for execution by large firms of contractors. He had at present a contractor under him,

who was constructing a large building work costing about Rs. 60,000, to whom he had given the whole contract after inviting public tenders. This contractor had been selected as his tender was the lowest of those received for the work, and he had been previously tried. He did not employ any superior engineering staff; only the same sort of man that the Public Works Department would have employed on a similar work, viz., a whole time *mistri*. This contractor was working in all respects on the same lines that the Public Works Department would have adopted; he had previously been given piece-work contracts on other works, and was not an engineer but merely a capitalist who had been in the contracting business for some time and had learnt by experience something about building construction. He would certainly not call him a professional man. This contractor employed one trained man who had formerly been in the Public Works Department as a subordinate, probably a lower subordinate, but not an engineer. The whole time employment of such an agent on the work was one of the conditions of contract. The contractor was an Indian and had no partners. He thought that the system of employing such a contractor was a successful method of getting work constructed as it relieved the Executive Engineer of a certain amount of additional work, especially accounts, which the latter would otherwise have to do himself. The only practical difference between this system and the piece-work system of construction was that in the latter the contractor was not bound as to quantities and time, as was the case with the contract system. The amount of supervision necessary over this man was less than would have been required in the case of piece-work contract works, distributed over a large area, and this would have been the same even had the work been done departmentally. For instance the sub-overseer who attended to this contractor's work at Alibag was made to attend to both the contractor's work and to other works near by. The employment of this large contractor for the whole of the work did not reduce the amount of supervising establishment required, but it reduced considerably the labour involved in accounts and similar matters. On the other hand he had not found any necessity for putting on more men, so merely employed the same number of overseers and sub-overseers on this work that he would have employed if it had been given on piece-work contracts. This large contractor could not lay out a building, the Public Works Department had to do that for him, and as the work was concentrated work it required exactly the same supervision as small piece-work contracts did under similar conditions. This opinion was not based only on his experience of large contractors in the Kolaba district; in other districts e.g., Khandesh, he had found the same.

70. There were sufficient substantial buildings even in the districts to afford scope for the extension of the regular contract system, but the contractors were unwilling to undertake either works of any difficulty or works entailing risk or trouble. Several works had been offered to them but they had refused to tender, pleading the difficulty of execution due to the nature of the work, its situation, or the conditions of labour. The contractor he had referred to above had been tried on a bridge project for a road on the piece-work system. He started the work but found difficulties and left it, being, of course, under no obligation to government as it was a piece-work tender. Judging by his own experience he doubted whether it would improve matters if large contractors were employed on buildings and roads works, but if there

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were a sufficient number of trained men available to take up works individually or in groups it might prove successful, so far as operations in the *mofussil* were concerned. There was not sufficient government work in the districts to employ fully firms of large contractors, who would only take up works costing more than, say, Rs. 50,000, but if a number of small works were grouped together in one locality such men would perhaps come forward to undertake them. The difficulty was to find trained men to take up the works. The men who did so now were business men and capitalists and had generally to rely on sub-contractors. These large contractors, therefore, followed practically the same system as the Public Works Department for works executed departmentally. The genuine "large contractor" should not be a middleman employing petty-contractors, but one who maintained his own establishment and managed the whole work himself, his employees merely acting on his behalf and carrying out his orders. If, however, the term "large contractor" was understood merely to mean a man who would be content with a single building work costing, say, Rs. 50,000 or so, (although such a man was really only a petty contractor), the system of employing large contractors for large buildings and petty-contractors for small scattered buildings would be suitable for work in the *mofussil*. In regard to the statement made in his written evidence that there was no competition among small contractors for government works, he explained that he was referring only to the Kolaba district. In the Khandesh district he had known contractors willing to take up works. Special difficulties existed in the Kolaba district, labour supply being very limited, and this was more or less the case in the whole Konkan.

71. Current repairs of buildings might, perhaps, be made over to the departments which occupied them, but he could not vouch for the success of such an experiment nor state definitely that it would be a satisfactory system of keeping buildings in repair. In regard to the suggestion that police buildings in the districts should, for instance, be made over to the District Superintendent of Police with a lump sum grant for repairs, he thought that a specific allotment should be made for each building, to be spent as the Public Works Department thought suitable, the allotment being based on standard estimates. The same system might, perhaps, be followed as was now adopted in the Salt Department in regard to current repairs (such as white washing, colour washing, etc.), and to cope with such work the local boards should be given extra establishment. Buildings at the headquarters of a division should be left in the charge of the Public Works Department, as they were, generally speaking, more costly and important.

72. In regard to the criticism brought against the system under which repairs were carried out in the Department, and under which the Executive Engineer was responsible for preparing estimates in detail for annual repairs, which was said to take up a considerable amount of that officer's time and to be unnecessary, and to the suggestion that, within the limits of allotment, the Executive Engineer should be able to carry out all necessary repairs without the formality of an estimate, he stated that he had been a member of the committee appointed by the local Government two months previously to consider this very question, and that the report of the committee was now under circulation among the members. They had decided that estimates should be done away with, as they involved a large amount of clerical and other labour which was of little practical use, and had suggested other methods of obtaining practically the same control over the expenditure on individual works.

73. The statement made in his written evidence that the relations of the Public Works Department with other departments were quite satisfactory except in the one respect that some departments were inclined to interfere with the professional side of the work, referred mainly to the question of the preparation of plans and estimates, and he gave, as an instance, a case in which an estimate for a large local board work had been framed by the Public Works Department. The Collector was the president of the local board and the Executive Engineer had to

deal with him in regard to the works of the board. The question arose as to what was the correct width of berm to be provided for a particular road. The president of the local board passed the plan which had been prepared, but his successor objected to the width, although the question was almost entirely a professional one. The witness referred the matter to the Superintending Engineer for orders, and that officer consulted other Superintending Engineers who all agreed that the widths as provided were required for certain special reasons. In his district, demands were frequently made by other departments calling for plans and estimates for buildings, and after these had been prepared the ideas of the requisitioning department sometimes changed and consequently revised plans and estimates had to be made out entailing a great deal of expenditure of time, this being mainly due to the fact that the exact requirements were not sufficiently specified in the first instance. These requisitions ought to have been looked into a little more carefully before being made, as in many cases, had they been so treated, it would have been seen that, having regard to the financial conditions of the departments making them, the works could not have been carried out in some cases for ten or fifteen years to come. His complaint was that other departments called for plans and estimates for works for which it was practically certain that no funds would be available for a considerable period, and he thought that before doing so they should take into consideration the state of their finances and consider what possibility there was of constructing the works in the near future.

74. His second point of complaint was that, after plans and estimates had been prepared, proposals for changes were made by the officer calling for the plans which thus had to be revised several times before they were actually passed, thus causing additional work for the Public Works Department and the Executive Engineer. This was especially the case if the plans and estimates were shelved for some time, and the work taken up after the lapse of years. This would not be so if the works were taken up soon after the plans and estimates were sanctioned. The alteration of these plans and estimates caused a large amount of extra work for the Executive Engineer, thus, for example, a project for a new road for a local board would cause considerable extra labour, if the department which had called for the plans and estimates desired them to be changed after they had once been completed.

75. As to whether he had any proposal to put forward for improving this state of affairs, he explained that his main complaint was directed against the work thrown onto the Public Works Department by the local boards that other government departments caused very little work, and that in these latter cases the Public Works Department knew where they were, and could advise the department as to the possibility of meeting their wishes. In the case of a local board, however, the Executive Engineer had no option and could not refuse to do the work.

76. He had had but little experience of municipal bodies. The Public Works Department drew up, under the provisions made in the Public Works Department Code, plans and estimates for municipalities for works such as drainage, which were executed by the Department on behalf of those bodies. He was not sure of the limit above which the Public Works Department undertook the work, but believed it to be Rs. 2,500. The municipality of Kolaba called upon him to prepare plans and estimates for a project costing above Rs. 5,000 for the drainage of a part of the town, and he had to prepare these for them, charging them of course the usual percentage for establishment and other charges as laid down by government. He was not altogether sure as to the relations of the Public Works Department with municipal bodies, as the former had very little municipal work to do, the municipalities doing most of it themselves. A municipality had, however, the right to call upon an Executive Engineer to do work, and this call came through the Collector. He would recommend limiting these works to those in connection with which government gave the

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municipalities grants-in-aid, and would exclude works which were purely their own. In the Kolaba district there were four or five municipalities which employed their own engineering staff consisting of men of the class of upper or lower subordinates who did work on buildings, roads etc., without reference to the Executive Engineer.

77. Local and district boards employed an overseer for each *taluka*, and in the Kolaba district there were seven or eight such overseers, and one at headquarters. There was no engineer in charge of these overseers. They corresponded in rank to the lower grades of upper subordinates, and were subject to no professional supervision.

78. Local and district boards had very little powers themselves except in the case of original works and repairs up to Rs. 2,500. Estimates for works costing above Rs. 2,500 had to be sent to the Public Works Department. Estimates for works costing below Rs. 2,500 were prepared by the officers of the board and sent to the Public Works Department for professional scrutiny only. The Public Works Department did not necessarily inspect works executed by the local boards, but acted only in the capacity of advisers.

79. Government charged 2½ per cent. on the amount of the estimates for scrutiny of estimates below Rs. 2,500, with the exception of estimates for sanitary works, such as for village water works, wells, etc. For works above Rs. 2,500 the plans and estimates were prepared by the Executive Engineer and the Public Works Department was required to undertake the construction of such works. The charge of 10 per cent. for establishment and 1½ per cent. for tools and plant was made where the Public Works Department employed their own establishment. The actual cost to the Public Works Department in this respect varied from year to year and he could not say exactly on what basis 10 per cent. was charged to local bodies.

80. The amount of local board work that he had to do took up an appreciable amount of his time. 12 per cent. of the total expenditure for the whole district was on work of this nature during the last year, and the proportion had increased in the last three years. His district was a recently constituted one, having been started in 1913 only. From his general experience he believed that the local fund work devolving upon the Executive Engineer amounted to about 20 per cent., but it might be more in certain districts.

81. He considered that the local boards should be made absolutely self-contained, that they should employ their own engineering staffs, and that they should execute works costing more than Rs. 2,500. This system would relieve the Public Works Department of a certain amount of unnecessary work at present devolving upon it, and he saw no reason why the boards should not be competent to do their own work if they had a properly organized establishment. He would not, however, advocate the system if the president of the local board were a non-official, but only if he were the Collector with a competent engineer under him.

82. To the suggestion that certain government buildings and roads might be transferred to the care of local boards, he replied that he would trust them with the maintenance of buildings only, but not with their construction. Even if the boards employed qualified engineering staffs the objection remained that the engineering establishment would be absolutely without any superior control. In the Public Works Department the Executive Engineer was controlled by the Superintending Engineer, while in the case of local boards there would be nobody to supervise the officer in charge, and it would hence be unsafe to entrust him with government works other than the maintenance of buildings. There were no excise or forest buildings in his charge in outlying places in the districts, as these buildings were managed by their respective departments. He was not in favour of making over the construction of works to local boards, and would allow them the maintenance of buildings only if competent staff was employed. His objection to entrusting the preparation of estimates for, and construction of, such a work as a police station to the district board was that

the engineer in charge would have absolute power so far as the execution of the work was concerned, and there would be nobody to correct him if he went wrong professionally, there being nothing to correspond with the control which at present existed in the Public Works Department. In the Bombay Presidency the government roads were wholly maintained by the Public Works Department, and some of the more important local roads had also been transferred to that Department for maintenance. He could not say on what principle these works were classified, nor on what principles one road was constructed out of government funds and classified as provincial, while another was constructed out of local funds and classified as district board, but very often roads constructed as local board were subsequently provincialized. As at present organized the district boards had not sufficient staff, and so they could not be trusted to undertake the maintenance of roads. The tendency was for them to hand over the more important ones to the Public Works Department in preference to maintaining them themselves, especially when the roads got into bad condition.

83. As an Executive Engineer he was entrusted with power to accord technical sanction to estimates up to Rs. 2,500. He considered that this amount should be increased, and that higher powers should be given to the more experienced engineers, considering that this would greatly reduce the work of the Superintending Engineer. He suggested that powers up to Rs. 5,000 in regard to the accord of sanction to estimates, and up to Rs. 10,000 in regard to the acceptance of tenders might be given to the Executive Engineer. As to whether there was any real advantage to be obtained from this differentiation, he explained that there were many more works costing between Rs. 5,000 and Rs. 10,000 than works costing above this latter amount, and it would be advantageous if the Executive Engineer could deal finally with all works costing less than Rs. 10,000 on the ordinary contract system.

84. His powers in regard to the purchase of tools and plant were not unduly restricted. Once the estimate for the annual requirements of his district was sanctioned he was able to purchase them up to that limit on his own responsibility. He had to submit the estimate, because he did not know what was to be his exact grant. It would, however, expedite work in certain cases if his powers in this respect were enhanced.

85. The power to appoint lower subordinates rested with the Superintending Engineer and with government, and no authority lower than the Superintending Engineer had power to inflict punishment over this class. The Executive Engineer could recommend a man for punishment, but had no power to inflict punishment himself on men in permanent service, though he could do so in the case of men on the temporary establishment. There would, he thought, be no harm if the Executive Engineer were entrusted with certain powers of punishment over the subordinate establishment, subject of course to certain restrictions, but he did not consider that he should be entrusted with full powers.

86. The witness had been Professor of Civil Engineering in the Poona College. He considered that the standard of instruction imparted in that college was quite satisfactory, as far as the engineers were concerned, being sufficiently high for the engineers, but perhaps a little too high for the upper subordinates. It was, however, difficult to differentiate between the classes, unless the system of recruitment was changed, because it was not known during the college course who was to be an upper subordinate and who was to be an engineer. In principle there was no objection to training engineers and upper subordinates together, but the system certainly imposed a slight extra burden on the upper subordinates. He did not think, however, that the provincial engineers were trained more highly in theory than was necessary. The remedy he suggested in regard to the training of upper subordinates was that at a certain stage the course should be differentiated, all the men going through the four years' course together for the first two years and a change being made in the third and fourth year.

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87. Under the present system, the educational qualification required for entrance was the intermediate examination, which entailed spending a year in an Arts or Science college. This resulted in students leaving Poona at the rather advanced age of 25 or 26 years, the average being 25. He did not consider that 25 years was too old an age for a man to start in professional life; he thought, indeed, that it was just about the proper age.

88. He did not much care for the idea of a change in system under which the standard of education at entrance would be lowered to the matriculation, and a certain amount of general education such as in mathematics and the like introduced into the curriculum of the engineering colleges as, even under present conditions, there was a certain amount of complaint that men could not follow the lectures, and hence he did not recommend any reduction in the standard of education required for admission. If the admission test were reduced to the matriculation standard it would put an extra strain on the engineering colleges. As it was, the principal had great difficulty in selecting men for admission to the college, and had usually to take in B.As. and B.Sc.s. which accounted for the high age of most of the candidates, and for the fact that most of those who were admitted to the provincial service were graduates. These men were generally graduates in mathematics and science, which subjects were of great value to them in the engineering colleges.

89. With reference to the suggestion that every engineer having passed his educational course should be given three years' practical training on work, he was of opinion that such a system could not be applied to each and every student, since some of them would be going in for private practice in Bombay and for such men training on irrigation works, for example, would be superfluous. He was not in favour of a course of practical training in every case, but men who desired to enter government service or service in native states or municipalities should have such training. The training of apprentices would involve a considerable amount of work on the part of the Executive Engineer, who would have to go through their note books month by month, and to devote a considerable amount of personal attention to their work.

90. The average number of students turned out annually by the Poona College was 32 to 35, but the tendency was for this number to increase. He complained of the restrictions placed on the admission of students to the college. There were many more men desiring admission than it was possible to cater for, and it was a great hardship that qualified men had to be refused. Such students had to go to the law and other colleges, which were already over stocked. The great majority of the students who passed from the engineering colleges got employment either under government or in native states or with local boards, and generally after a year or two almost every one had got something to do. There had been some slight difficulty lately on account of the curtailment of expenditure on railways and other works, but under normal conditions there was ample opportunity for all students to obtain employment.

91. With regard to the suggestion that the Indian members of the Public Works Department who had been employed five or six years in the Department should have an opportunity of going to England for further training or experience, it was merely his intention that the Public Works Department should have a system of study leave somewhat on the same lines as other technical services in India.

92. In explanation of his complaint that there were no specialized courses in the Poona College, he stated that formerly there were certain branches of study which were considered optional such as architecture, sanitary engineering, mining, metallurgy, etc., to which students directed themselves according to their own choice, but under existing conditions this was no longer so. Every student had to undergo a certain course in sanitary engineering, water supply, drainage etc., and had no choice in the matter. He thought that for a man who ultimately wanted to settle down in private practice as an architect an advanced knowledge of irrigation, for instance, would be of no use. It would be better if he

had more training in architecture and less in other subjects which would be of no use to him in after life.

93. (*Mr. Cobb.*) The average age of entrants other than B.As. to Poona College was about 21, and they had generally received their previous education at government high schools or private colleges such as the Wilson College in Bombay.

94. The curriculum in these colleges was directed towards giving students a sufficient knowledge of science so as to prepare them for scientific engineering work when they got to Poona, and was a combination of science and arts courses.

95. Questioned as to his suggestion as to the specialization of courses, and asked whether it would be a good thing if each of the engineering colleges developed special classes of its own, one for each important subject, he replied that he did not think that such a course was practicable, since the average man preferred to confine himself to his own presidency or province and not to go elsewhere for his instruction. The question of expense was also an important factor.

96. (*Rai Bahadur Ganga Ram.*) With regard to his suggestion that temporary establishment should be made permanent, the witness explained that he had referred only to the unexpensable works establishment, and not to the regular establishment. Even when a particular work was completed there was always a demand for a certain amount of works establishment on the maintenance of roads and buildings, and he employed in his district of three sub-divisions at least six or seven such men in each sub-division without interruption from year to year.

97. There was no hard-and-fast rule as to the percentage cost of temporary staff that might be employed on a work, this percentage cost was generally restricted to 5 per cent. In his district it was often only 3 per cent.

98. Asked whether if he had a building to construct in an out-of-the-way place, which was the head-quarters of an irrigation sub-division, the rules would permit of his making over the work to a competent Assistant Engineer of the Irrigation Branch, he replied that the practice of making over works to another branch had never been adopted in the Bombay Presidency, nor did he consider that its introduction was possible. In the Bombay Presidency executive charges comprised both buildings and roads and irrigation works, and there was a minimum of overlapping.

99. Out of the 20 or 30 students of his year at college, nearly all had been provided for as engineers, architects, etc., and very few had taken to contractor's work. In those days there was a course in architecture in the college. There was no field for private engineers or contractors except in Bombay.

100. He did not agree that private practice, on the same conditions as were applicable to the Medical Department, should be allowed to Public Works Department officers, because under present conditions it would impair the efficiency of the Department, the work done by it being very heavy as compared with that done by the Medical Department, even taking into consideration the fact that medical men were bound to attend to their cases at a moment's notice whereas Public Works men could if they wished, do so at leisure.

101. If he were allowed to retire after 20 years' service on full pension he would do so, if he had the chance of being admitted into a firm and taking up private practice.

102. As to how he analyzed his rates and what percentage of profit he allowed to the contractor when framing his schedules he explained that it was very difficult for Executive Engineers to gauge the exact amount of profit necessary for contractors, and that the latter always complained if they did not get at least 10 per cent. He had found from experience that a profit of 10 per cent. was sufficient for piece-work contractors.

103. In the case of large contractors, however, who would expect more in consideration of the expenses involved by reason of the establishment they would ordinarily maintain, he would fix the minimum at 15 per cent. This would, of course, depend on the extent of the works which the contractor took up, but if he

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could persuade a skilled contracting firm to take up several works together, he thought he might be able to save an extra 5 per cent. on the cost of government establishment.

104. The reason why local boards in the Bombay Presidency transferred their roads to the Public Works Department was that the former considered the work of the latter to be more efficient than that which they were capable of doing themselves, since, as at present constituted, the local board establishment was very poor—poor in ability and in fact in everything, even in integrity.

105. He recommended that the educational qualifications required for entry into the Poona College should not be raised from the F. A. to the B. A. merely because the Roorkee College had fixed the B.A. for their entrants.

106. He was in favour of the introduction of specialized courses into the Poona College in such subjects as sanitary engineering, and recommended an extension of the present three years' course by an extra year in the case of selected men, this extra year being devoted to such special subjects.

107. (*Mr. Mackenzie.*) It would give welcome relief to Executive Engineers if some method could be arranged for taking away unimportant works from their charge and handing them over to other agencies. As far as he himself was concerned he would be glad to be relieved of all such works. But even if this were done he doubted whether it would result in any alteration in the extent of charges or in the reduction in staff, as the relief would have to be very appreciable to enable the Executive Engineer to undertake a bigger charge than that he held at present. If the amount of this relief developed to the extent outlined in his memorandum he thought that it might lead eventually to the expansion of executive charges, but considered that the substitution of other agency, whether private or quasi-public, for the Public Works Department staff would result in loss of efficiency.

108. Asked whether the handing over of small and unimportant works to private enterprise would tend to encourage self reliance and independence among Indians, he replied that while there would be no harm in this course if capable Indians were selected for the work, he did not think that there was at present enough engineering talent among them for the purpose, if adopted on a large scale.

109. Men turned out of engineering colleges did not as a rule take up contracting as a profession, but they would be good enough to undertake work as engineers to local bodies, provided proper supervision were exercised over them by the Public Works Department.

110. (*Sir Noel Kershaw.*) He thought that the class of teachers obtained for the engineering colleges was good enough, and that the salaries offered were sufficient to attract really capable men. If a suitable course of instruction were provided in the engineering colleges it would, he thought, be possible to prepare men for subsequent work as contractors, a certain amount of theoretical education being omitted from their course and practical instruction substituted. For these contractors there would have to be at least two years' training on works, to fit them for their profession, before they were given their contractors' diploma. The two years' training on works should be compulsory and they should receive theoretical and practical training both inside and outside college. It would be essential that the practical training of these men should be given by other contractors, a knowledge of prices, materials and

management of labour, etc., being thus acquired by them during this period. It was not possible to give instruction in all the branches of contracting work during the educational course, but a knowledge of estimating, methods of buying, etc., could be acquired while at college.

111. (*Mr. Kent.*) He did not think it proper to entrust a work to an engineer of the Irrigation Department, even though the place where the work was to be executed was nearer to the irrigation engineer's headquarters. His reason for this opinion was that the sub-divisional officer in charge of irrigation had practically as much to do within his own sub-division as he could undertake in the ordinary course of his duties. If, however, the irrigation Executive Engineer came forward with a request that the sub-division near his headquarters might be made over to his charge, the witness did not think that there would be any objection to such a transfer.

112. He did not think that it was necessary to separate the Buildings and Roads and Irrigation Branches, even in Sind, where the bulk of the irrigation work of the Bombay Presidency lay.

113. In regard to specialization, he thought that a man who had received special education in a certain branch should be encouraged to study that subject further on actual works, but considered that the system under which a man could be transferred from one branch to another after a certain length of service was unobjectionable, and that the present arrangement worked very well.

114. His suggestion that contractors should undergo training in a college for three years, and a practical course for another year, referred more especially to the small contractors in regard to whom difficulty was found in isolated districts, owing to their lack of engineering knowledge. He did not refer to big contracting firms, but the petty-contractors, who were available, were all ignorant men and hence required training.

115. Local agencies, such as the local fund engineer establishment in a district, should contain not only subordinates, but also an engineer to supervise the subordinate staff. Works costing up to Rs. 10,000 which were now executed by the Public Works Department might then be transferred to them. The local fund engineer would have nothing to do with works exceeding Rs. 10,000, which would be done by the Public Works Department. He advocated this limit as there would be nobody with the requisite professional knowledge to control the local fund engineer, or to correct him if he went wrong, and hence there was a possibility that public money might be wasted.

116. Any arrangement under which the local fund engineer and the Public Works Department engineer would work side by side would be uneconomical, and there would be a certain amount of overlapping of establishment. To prevent this as far as possible he suggested that a portion of the maintenance of the buildings at headquarters, and the whole of the maintenance of buildings outside headquarters, should be entrusted to that engineer. He did not think that it would be feasible to hand over the whole of the government works now carried out by the Executive Engineer to the district engineer with a subordinate staff, subject to supervision by government Inspectors or Superintending Engineers. He considered that the result would be to increase the burden of the local board engineer to the same extent as, or to an even greater extent than, that of which the Executive Engineer now complained.

G. WHITT, ESC., F.R.I.B.A., Consulting Architect to Government, Bombay.

Written Statement.

117. (1.) **Economy and suitability of methods of execution of public works.**—The first point that appears to me to call for consideration is the existing arrangement of grouping together, administratively and practically, the design and erection of buildings and the construction and maintenance of roads as one branch, in which the units are more or less interchangeable.

(2.) The present system has grown up naturally along with the development of the country, where men, especially engineers, have had to undertake a great variety of duties; now, however, it has been found advisable to specialize and I think this policy should be followed, as far as practicable, in the case of roads and buildings.

(3.) The two employments appear to me to be so distinct that, in the interests of economy and efficiency, specially trained men should be employed in each. 1

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cannot be economical to employ a skilled builder in supervising road repairs, or tend to efficiency to employ a good road man to superintend building operations.

(4). I would suggest the formation of separate branches, one for the superintendence of the construction and maintenance of roads, which should be a road surveyor's or road engineer's department, and the other for the design, construction, and maintenance of buildings which should be an architect's department.

(5). With regard to the latter I fear some misconception exists as to what the work of an architect is, from the fact that the expression "a building of an architectural nature" is occasionally met with in India, apparently to distinguish such an one from some other class, but as architecture is the science of building all structures are of an architectural nature provided they are properly designed and truly constructed. The thought, however, underlying the expression appears to be of an erection on which time and money have been expended in embellishment or decoration. This idea is altogether incorrect, a building richly ornamented does not mean that it is in any way more architectural than the simplest of structures, as the architect's function is not to invent decoration but to think out construction in its most perfect expression, and I am certain it would be found advantageous to employ competent trained architects in the design and erection of all buildings in India, without consideration as to whether this is unimportant, or that out of the way; it must be remembered that these works remain as lasting monuments of our time, and we shall be judged by them in comparison with the works of the past in India in which a high standard of construction and expression has been set.

(6). One most important point that has to some extent been lost sight of is, that the architect to fulfil his proper function must be the master builder as well as the designer, he must control and superintend the erection of his works, as under these conditions only is it possible for the structure to realize the designer's intentions and for the builder to develop his own capabilities. A designer restricted to an office and paper may be compared to a composer without an instrument.

(7). Under the existing system of carrying out public buildings it is not possible for the designer to undertake the superintendence of all his works as they are so widespread, but in the interests of efficiency this arrangement should be made, wherever practicable, and, where the architect himself cannot be in charge, I should like to see a trained deputy capable of interpreting his intentions.

(8). The methods adopted for the execution of civil works under the control of the government architect in Bombay are as follows. New buildings in the city are now undertaken in what is termed the "Architectural District," in charge of an engineer responsible to the government architect, the latter acting in the position of Superintending Engineer for the district. This answers well but it could be improved if the district was in charge of a trained assistant architect with the powers and staff of an Executive Engineer, provided he possessed the knowledge of departmental routine and procedure necessary under the existing system. When plans and probable estimates have been sanctioned by government the work is thrown open to tender and in most cases the lowest is accepted, and the work carried out under the charge of overseers on whose ability much depends as they take the place of the clerks of works in Europe but lack the practical knowledge of the latter, being usually men taken from engineering colleges where the training is theoretical and they have to pick up their practical experience as they go along, whereas the clerk of works is always a master craftsman in at least one trade to begin with, and possesses the sure knowledge that can only be obtained by actually doing the work.

(9). I should like to see the overseers in India recruited from the craftsmen and furnished with the theoretical knowledge they need after they have acquired practical experience for themselves. The tradesman at home attends night classes to fit himself for work as a foreman

or clerk of works and it may be possible to arrange something of the kind in India in spite of the differences of conditions and customs.

(10). With regard to the submission of plans and estimates to Government for sanction, I think it would be better if in the first instance no detailed costs were filled in the bills of quantities but only lump sums furnished. The rates filled in are based on the costs tendered for similar works in progress but there is no doubt the figures get about among the local contractors and form the basis of their tenders. I should prefer the bills of quantities to be made out in blank and to submit them with lump sum totals along with the plans for sanction. This would save labour in the Secretariat where the rates entered appear to be carefully scrutinized and in some cases returned for revision, whereas these are only probable costs furnished by the architect, the real rates will be tendered later by contractors in competition with each other. What government are concerned with in cases where work is open to tender is not the estimated rates but the total cost of the scheme. If the cost is too much it cannot be reduced by altering probable costs but only by altering the structure or omitting items, all of which appear on the drawings or in the schedule of quantities.

(11). With regard to the system of preparing schedules of quantities, at present all works in a building are billed together, floor by floor, and one contractor tenders for the lot, arranging his own sublets. In my opinion, it would be preferable, in places where there are firms representing the different building trades, to make out the schedules for each trade separately that is, mason, joiner, tiler, plumber, plasterer, smith, painter and glazier, and permit small firms to tender for their own particular work as well as larger contractors for the whole. In this way the lesser craftsman would have an opportunity which is open only to the capitalist at present.

(12). With regard to buildings to be erected in the districts, the method adopted at present in most cases is for the local engineer to ascertain the requirements from the department for which the building is to be put up, and prepare plans which are forwarded to the government architect for his views. In the majority of cases it is found advisable to rearrange the plans and prepare fresh designs, so that it is economical for the local engineer to spend the least possible labour in setting out the requirements, in fact, a statement of accommodation with carefully detailed plan and sections of the site, together with information as to directions, surroundings, approaches and climatic conditions are preferable to work from. It is a grave mistake to think an architect can prepare satisfactory exteriors for a bad plan, as the appearance of a building is the expression of its internal arrangements and purpose.

(13). I would suggest altering the present method to this extent at least, that when it has been decided to erect a building in a certain locality the officers of the department concerned should deal directly with the architect, who would first visit the proposed site, either personally or by deputy, and obtain and discuss the requirements on the spot before preparing the preliminary sketch design. The architect would consult the district engineer regarding the materials and labour available, local building rates and all technical questions, with which he would naturally be familiar. This arrangement would give more satisfactory results and save much labour to the engineer and his staff.

(14). At present the execution of works in the districts has to be supervised by local Executive Engineers under the Superintending Engineer of the division as the distances are so great that it would not be possible for the government architect, with his present staff, to visit them sufficiently often to be certain of satisfactory workmanship, but it is undoubtedly in the interests of buildings in this country to arrange, wherever possible, that the architect who designs the work should also superintend and control its erection, and I should like to see the further extension of the employment of the architect in his proper sphere.

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(15). In a province like the Bombay Presidency, I should like to see branch architects' offices established in the principal building centres. There would then be opportunity for the architect to study and become conversant with local building traditions and the surrounding influences which direct the trend and development of style and methods suited to a particular district, and by this means advance the art of building in India. It may be objected to such a course that it means duplicating officers in certain districts, but it should be possible to arrange areas in which the architect would take entire charge of all building works and relieve the engineer to undertake a wider sphere in his own particular branch.

118. (II.) Encouragement of other agency.—Under the existing system, I think private enterprise is encouraged wherever practicable in the construction of public buildings. No architect or engineer will employ departmental labour where it is possible to obtain a contractor to undertake the work on reasonable terms.

(2). I am strongly in favour of any alteration in the existing system that would tend to encourage the growth of capable firms in the building and allied trades. At present building contractors, even in a city like Bombay, are little better than suppliers of labour and materials, with the exception of a few firms engaged in special trades, mostly under European management. The difficulty lies in the fact that the contractor is rarely a tradesman himself, but is usually a capitalist employing *mistris* for any practical knowledge he requires, which throws a great deal of what should be the contractor's work on the overseers in charge of the building. This is not a satisfactory state of affairs as it is rare to find a good firm in any trade in which the head is not a practical man.

(3). If contractors could be persuaded to put their sons to a trade instead of to college with a view to their becoming more efficient tradesmen than their fathers it would be a step in the right direction.

(4). At present the Indian building contractors do not possess yards or workshops, they convert the building sites for the time being into temporary shops where all the work is done by hand. This is not an economical practice in a city like Bombay, where high land values put a premium on speed in construction. Materials ought to be prepared in the builders' yards and supplied on the works in such quantities to make the use of steam or electric cranes feasible, at present there is not, to my knowledge, a derrick in use on a building in Bombay, the nearest approach being a steam winch which I have employed at the Museum and Jehangir Hall for hoisting concreting materials for dome construction.

(5). Improved methods will come in time and every encouragement should be given in that direction, but it is necessary to proceed with caution as Indian conditions differ greatly from those in Europe. As an instance, one contractor with advanced ideas erected a small pneumatic plant for stone dressing but it failed, the Indian workmen could not stand it: they certainly did not like the innovation, but apart from their dislike they were physically unable to stand the strain of the vibration set up by the tools, and I believe something of the same difficulty has been met in attempting to use vibrators for consolidating concrete. In another case a stone sawing and planing plant was set up, but this was not a success, the tools could not be tempered in Bombay to work the local basalt.

(6). One direction in which improvement could be effected is with regard to the quarrying and supplying of stone. At present this is undertaken in a very casual and unsatisfactory manner and the supply is often inadequate, even for the present leisurely methods of building. Plots are let out to contractors for particular works and he either digs out the stone himself or sublets the work to some one else and it is carried on without tackle and without system. I think it would be a wise step now for government to take stock of the varieties and available sources of supply of building stone in this presidency, and to obtain the advice of an expert on the subject of developing quarries and transporting the materials to the chief building centres.

(7). At present the construction of public buildings is entrusted to private firms, but it is necessary to provide adequate supervision as the contractors are not craftsmen, and until the Indian contractor improves, or is prepared to employ skilled and trustworthy foremen, the present supervision cannot be reduced, and if it were taken over by the contractor he would have to include the charges in his estimates so the cost of works would not be altered.

(8). I have already made a proposal for altering the present system of scheduling quantities to encourage smaller firms in special branches of the building trades to tender for their own portions of large works.

(9). With regard to the upkeep of public buildings in towns and districts where the tradesmen are available the responsibility should rest with the occupants, subject to an annual inspection by a clerk of works, who would, where necessary, specify where repairs were required.

119. (IV.) Relations with other departments and sub-branches.—With regard to the Public Works Department meeting the needs of other departments and the relationship of the special branches I have stated my views on the advantages of the department, or body for whom a building is to be designed, dealing directly with the architect regarding the plans, in place of with the district engineer.

120. (V.) Decentralization.—With regard to decentralization within the Public Works Department itself, this simply means the extension of the present policy of employing specialists in their own branches, and is undoubtedly the means by which higher efficiency in design and execution of works is to be attained. I have already suggested the advisability of putting all building works in charge of the Architectural Department, and establishing branches in suitable centres. I should also think it would be advantageous to have a special engineering section for the design and construction of stone and concrete bridges, where experts would be able to develop and improve on existing methods as they proceed, in place of a district engineer being called on to design and construct perhaps one big bridge in his career and necessarily tied to text books for his design and having to experiment with his methods of construction. A reinforced concrete specialist would also be a valuable addition to the Department. He should be an engineer who has had practical experience at home and would design and advise on all reinforced concrete works to be undertaken.

121. (VI.) Simplification of procedure.—One of the difficulties in this country is to keep abreast of the improvements in fittings and appliances connected with the building trades. At home agents regularly lay all new developments their firms bring out before people interested in the building and allied trades, and either exhibit samples, or arrange for the person interested to visit show rooms or works in which the article has been installed. Under the existing system there is very little inducement for firms or their agents to approach government officers in India who deal with buildings. If the powers permitting the local purchase of materials imported into the country were extended and greater freedom allowed in placing orders with local agents, instead of having to indent on the Stores Department, it would encourage firms in the country and local agents of home firms to bring samples of new or improved goods to the notice of possible buyers and also to keep stocks in this country.

(2). A permanent building trades exhibition would be a useful institution in Bombay, if it were arranged as a live place where agents exhibited their goods, furnished quotations, and booked orders. This might be considered when the north wing of the Museum of Western India, which is to be the Industrial Section, is erected, a portion of it might be utilized as a building trades exhibition for Indian and home firms. It would not only be of assistance to the buyer but it would stimulate the Indian manufacturer to compete with the home productions.

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(3). With regard to the regulations governing the accommodation to be provided in residential quarters the present arrangement is that the cost of the house should be fixed in proportion to the pay of the occupant, regardless of the fact that the cost of construction may be double in one district what it is in another. I think this could be improved by laying down definite areas of accommodation for different grades of pay and drawing up general specifications for the standard of finishing. This would save a good deal of time and labour at present spent in discussion.

122. (VII.) Education.—I do not know whether the system of education in government engineering colleges is sufficiently advanced to provide fully qualified engineers though I doubt it, but at present there is no adequate provision made for the education of intending architects. In Great Britain the old system was to article a lad as pupil in an architect's office and much was left to chance and the youth's own application as to what he learnt. Now architectural schools and colleges have been established where a student learns the history of building and the principles of planning, design, and construction and is fitted to enter an office, where he is able to acquire the practical knowledge of works to prepare him for private practice.

(2). The School of Art in Bombay at present provides a good morning course of instruction for architectural draughtsmen, supervised by an architect on the staff of the school with the assistance of local architects, and

so far as I am aware is the only institution of the kind in India. This school ought to be developed into a full-time college of architecture with the necessary buildings, staff and equipment to train students to take a degree in their profession, that is to become Associates of the Royal Institute, and also to be recognised as Bachelors in Architecture by the University of Bombay. The institution of a school of this nature would tend to raise the standard of young men entering the profession and do much to improve present day building in India.

(3). A scheme for the course has already been formulated in consultation with the University and College authorities and I hope will receive the encouragement and assistance necessary to make it an established fact at an early date.

123. (VIII.) Practical training.—I do not know what provision is made for practical training on works for engineering students, but no provision of this nature has so far been made for students of architecture. The best education a student could be given, after finishing his college course, would be to enter an architect's office and assist in the preparation of the working plans for a new building, and when the work is commenced to be sent on it as an inspector of works throughout its construction. When a college of architecture is established a training on these lines might be arranged for at least a certain number of the passed students, by placing them with the various government architects in India as vacancies and opportunities occurred.

MR. G. WITTET called and examined.

124. (President.) The witness stated that he was Consulting Architect to the Government of Bombay, and that he had held that appointment for nine years. He had had ten years' experience in England prior to recruitment, had come out to India as an assistant architect, and had been appointed as Consulting Architect three years after arrival. He had thus had twelve years' Indian experience, during the whole of which time he had been stationed in Bombay.

125. As Consulting Architect, he was responsible for the design of all important buildings constructed by government in the Bombay Presidency, and his advice was freely sought in regard to smaller works also. The plans were generally sent up by the Executive Engineer of the district concerned, and in many cases it was necessary for the Consulting Architect to redesign the whole project. The chief buildings in the presidency town were not only designed by him, but were also executed under his supervision.

126. The witness suggested that further specialization within the Department was desirable, buildings being separated from roads, and entrusted to men who had made the subject their life study. If possible, all buildings, including those scattered throughout the districts, should be placed in the charge of architects, even though such an arrangement might, at first, involve a certain amount of duplication of staff. It would possibly be difficult, in some cases, to avoid overlapping, and he had not sufficient experience of conditions outside Bombay to enable him to formulate a practical working scheme, but he considered that the suggestion he had made was an object which should be aimed at in any reorganization of the Department. A certain number of building centres should be formed into a division, as had already been done in the presidency town where all government buildings of importance were in executive charge of the Consulting Architect. Some of the larger centres, such as Poona, Karachi and two or three others, probably contained sufficient buildings to justify their being formed each into a separate division under the charge of an assistant architect. The criterion would be the amount of work to be done, and it would be necessary, before arriving at a decision, to take out details of expenditure on buildings in these places. The scheme was based on the general principle that the architect was a master builder as well as a designer, and that the scope of his activity should not end with the design of the building, but that he should also be responsible for its construction,

127. There were probably forty or fifty architects of sorts in Bombay, practising privately as architect engineers. It was difficult to say how many were really qualified, but he doubted whether there were more than three or four to whom the President would care to entrust the construction of a house for himself. There were possibly four or five among them who were Fellows, or Associates, of the Royal Institute of British Architects, qualifications which connoted a certain standard of efficiency. There were, according to the directory, sixty-one architects and surveyors in Bombay altogether.

128. He thought that the appointment of a government architect must have been decided upon, because the need for such an officer was felt. Presumably the fact that government did not go into the open market for the design and construction of their buildings was only due to their desire to employ the best man they could get for the work; it was, in any case, much cheaper for them to retain a salaried architect than to pay the fees of private practitioners.

129. The witness considered that, under the present system, all architects should be specially recruited, and that the architectural branch should be constituted as a specialized branch of the Public Works Department. Government would, however, have a much better chance of getting good architects to come out, if the men had reasonable prospects of permanent employment. At present they were all on short term contracts, and their appointments were un pensionable. Men would probably be more anxious to serve if their futures were assured, so the system suggested would probably prove more satisfactory from the government point of view also. There would probably be more discontent amongst government architects but for the fact that the various provinces were altogether separate, there being no connection between them, so that the disparity of terms was not so obvious. Government did not hold out much in the way of prospects to young architects, and the initial salaries offered were miserably insufficient. Although these men came out to India as officers their pay was so small that it was extremely difficult for them to live in a place as expensive as Bombay, and this naturally led to discontent after a very short time.

130. In regard to the facilities for the education of architects in India, he knew of only one school, the School of Art in Bombay. This contained a draughtsmen's class, which although it had been started seriously only about seven years ago had gradually developed

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and expanded and now provided a fairly good course for students; this was, however, not nearly sufficient for the training of an architect. There was no course for architects in the Poona College. He would like to see a college founded with a full time course in architecture and attached to the School of Art in Bombay rather than to the Poona College. There was, he thought, a sufficient demand in India to justify the expenditure on such a school, the measure of the demand being the large amount of bad work which had been done in India during recent years. There was always a demand for draughtsmen, for whom some training at least, and preferably, a college training, was required. It was not sufficient that a draughtsman should merely be able to draw, but he must also be able to understand what he was drawing.

131. In regard to his own experience of building work in Bombay, and of the system under which such buildings were erected, he explained that special work, such as reinforced concrete domes and concrete piling, was usually done departmentally. Otherwise the work was put out to tender in the open market, and contractors took it up. These men were, however, not contractors in the real sense of the word but merely material and labour suppliers. Contractors in Bombay who undertook building contracts employed no engineering staff but only *mistris*, who, although some of them were fairly competent, had generally but little knowledge of the outfit and plant required.

132. The Bombay Municipality was self-contained and had an engineering staff and architect of its own. He had advised the Bombay Corporation on certain matters, but had never designed any buildings for them. He designed the big hospital in Bombay, which was, however, a private work, having been employed for the purpose by the King Edward Memorial Committee. His employment had yet to be arranged with the municipality and required the sanction of government. A good deal of building was done by private firms in Bombay, but he had no idea of the comparative cost of buildings constructed by government and those constructed by private enterprise.

133. He thought that the present system of employing a government architect for the execution of work was cheaper than going into the open market. His pay was less than an architect's percentage on his work would be. The whole cost of the government architect and of the staff employed by him on the preparation and execution of projects including the Executive Engineer attached to his office and the outdoor staff amounted, during the last ten years to only Rs. 4,58,800 as against Rs. 9,33,000 which would have been payable to private architects for the same work, calculated at 2½ per cent. for preparation of plans, working drawings and specifications, 2½ per cent. for supervision of works actually executed by the architectural district and 2½ per cent. for surveyors' fees and establishment on the latter works.

134. In connection with the preparation of estimates he thought that it would be better if, instead of costs being furnished in detail, only lump sums were shown when estimates were submitted for sanction. The final rates were really fixed by the contractors who tendered for the work and he did not want the rates which he anticipated made public. Rates furnished to government by the architect were apt to become known, and so form the basis of contractors' tenders.

135. In regard to his suggestion that tenders should be called for each separate class of work, such as masonry, joinery, etc., he thought that the adoption of this system would lead to more competition among the smaller tradesmen.

136. The witness complained that his operations were hampered by the rules regulating the local purchase of stores, and that he was not allowed sufficient latitude in the matter of purchasing such stores from England. He did not see enough of novelties from home, because no encouragement was offered to agents of English firms to bring them out to India. He considered that more elasticity should be allowed to officers and that they

should be authorized to exercise discretion as to buying locally or indenting upon the India Office.

137. He maintained a staff of his own in his office, but rather than introduce a system under which students who had passed out of Poona College should be admitted to his office to be trained as architects, he would prefer that they should receive a preliminary training in the office of a private architect before they came to him. He admitted that students sometimes had to labour in an office without getting much opportunity to learn their work as architects.

138. He thought that overseers employed on building works should be recruited from craftsmen rather than from the present type of men as were obtained from the Poona College. He had had practical experience of the upper subordinates produced by that college and some of these who had been attached to his office had turned out very well indeed. Craftsmen intended for employment on other duties would have to be educated before they learnt their trade, and study certain of the subjects which they would be required to know as overseers later. He did not know of any system of night schools in Bombay but thought that their introduction would be an excellent thing.

139. He would like to see a Buildings' Trades Exhibition of a live nature instituted in Bombay, in which the exhibits would be continually changed. He did not know whether such an experiment has ever been tried in India. He did not think there was a Buildings' Trades Association in Bombay, but there was an Architects' Association, of which, however, he was not a member.

140. (*Sir Noel Kershaw.*) He could, if necessary, prepare plans for an electrical power-house, and thought that it would be advantageous to employ an architect even on a work of that kind. In such cases the architect would collaborate with the engineer, and the result would be a structure in which the nature and purpose of the building would find expression. Leaving aside the question of the appearance of buildings an architect was in a better position to obtain general convenience of arrangement than an engineer, since the former was trained with this particular end in view. Once the requirements were laid down it was part of the architect's duties to show how they could best be met. Taking the case of the railway stations now being built in America the engineer specified what was required in regard to the arrangement of the lines, but the general design and lay out were entrusted to an architect.

141. It was, in his opinion, desirable to have a separate tender for each particular trade in building work. At home the architect preferred to deal with a single large contractor, and this would be the better plan in India also if such contractors were available, but the so-called contractors in this country were capitalists and nothing more. His idea was to encourage small contractors, a policy which he believed would in time lead to competition and a reduction of rates.

142. He had two classes of staff under him, the men who came out from home as assistant architects, and the men whom he got in this country the latter being mainly draughtsmen for his drawing office, or Public Works Department subordinates who were attached to his office as estimators, or as superintendents of works. He would prefer that the men who superintended work should be drawn from among the Indian craftsmen who knew exactly what building meant.

143. (*Mr. A. T. Mackenzie.*) In regard to the question of the local purchase of stores, the witness was asked whether he thought it would be feasible for the Government of Bombay to appoint a government buyer who would reside in Bombay and obtain tenders when required, either in India or from England. The tender would be accepted and the stores obtained by this officer, who would be paid a certain percentage on the amount of the order but would receive no commission of any sort from the seller. The witness was afraid that this system would bring no new materials to the notice of the architect. When, however, it was pointed out to him that the buyer would be in close touch both with the office

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of the witness, and with the building trades elsewhere, and would be responsible that all goods delivered were in accordance with specifications, the buyer receiving only a small percentage, say 3 per cent. on an engine and 1½ per cent. on a simple order for pipes or girders, the witness admitted that this would be at least a step in the right direction and a great improvement on the present system, besides being much more expeditious than indenting on the India Office. There were all sorts of improvements continually going on at home in such details as window fittings, etc., which he never saw out here, and even if he found them in a catalogue it was hardly possible to indent on the India Office for a small quantity. If, however, they were obtainable from a firm in India merely the required number could be ordered. It was with this object in view that he had suggested a Buildings' Trades Exhibition.

144. Asked whether architects looked upon the building arts as an expression of the emotions, and whether it was possible for a European to express the emotion of an Indian in architecture, he replied that he did not think it was exactly personal emotion but rather the intent and purpose of the building which should be expressed; for example, if a court were to be built the architect would endeavour to make the structure express itself as such. Indian art should, however, be as far as possible an expression of Indian emotion and it would be an excellent thing if an indigenous school of architecture could be provided. At the present time Indians had to go to England for their training in architecture.

145. (*Rai Bahadur Ganga Ram.*) With regard to his remark that the designs of buildings, whether big or small, were sent to him for opinion, and asked whether he gave his opinion simply on the architectural features, or on the plan, or on the structure generally, he replied that he began with the plan, then dealt with the structure, and lastly with the appearance of it. The plans of buildings which he received from the engineers had usually to be revised.

146. In the technical schools they trained pupils to work out calculations, stresses, etc. This was also taught in the draftsmen's class in Bombay and it was part of an architect's curriculum in England.

147. He could not say, even roughly, what would be the extra cost of splitting the Public Works Department into two branches.

148. Designs for imperial works were submitted to the Consulting Architect to the Government of India, but not those for provincial works. The latter were scrutinized by the Chief Engineer. He hoped that the new Customs House which was an imperial work

designed by him, would be one of his best buildings in Bombay; it was designed in a strong and simple style.

149. He was very interested in Indian architecture as a whole, especially in that on the western side of India during the 15th and 16th centuries and he was trying gradually to get opportunities of developing this. He had utilized Indian *mohifs* in the Prince of Wales Museum. He endeavoured to do work suited to the aspects of particular places and conditions; thus, in Sind, if funds permitted, he would provide a double roof with an air space in between. In other places a dome was often a very suitable form of roof.

150. (*Mr. Cobb.*) He had found no particular difficulties in supervising the work of contractors and he was assisted in such supervision by the subordinates attached to his office. He had got men who had been with him for ten years and who knew fairly well what he wanted. These subordinates were permanent men but his Executive Engineer was always liable to transfer.

151. In connection with the education of craftsmen and clerks of works, he considered that they would have to be able to read and write a certain amount of English. What they really required was a general elementary education.

152. The Consulting Architect to the Government of India had, in general, no connection with provincial buildings, but above a certain sum—at present 16 lakhs—the sanction of the Government of India was required to such works, and the plans were sent to the Consulting Architect. Plans prepared by the witness had been revised by the Government of India, and they generally came back with recommendations in regard to structure and materials. Provincial buildings costing less than Rs. 16 lakhs were usually designed by him and approved by the Chief Engineer without any outside help.

153. He did not see how all the architects in all the different provinces in India could be combined into a single service on definite terms and placed under the direct professional control of the Consulting Architect to the Government of India. The Bombay Presidency alone was as big as Great Britain and Ireland put together. It would be merely a duplication of labour if the Consulting Architect to the Government of India came down and inspected plans prepared by the Consulting Architect to the Government of Bombay; all plans and estimates for provincial works costing over a certain amount already went to that officer, and the Government of India exercised a still closer control over imperial building projects.

At Bombay, Tuesday, 9th January 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

C. S. COBB, Esq., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

R. J. KENT, Esq., Chief Engineer and Secretary to Government, Bombay.

D. G. HARRIS, Esq. (*Secretary*).

SIR FREDERICK L. SPROTT, KT., Chairman, Bombay Port Trust.

Written Statement.

154. (I.) Economy and suitability of methods of execution of public works, and (II) Encouragement of other agency.—My experience in work in the Public Works Department has been entirely in the *mofussil* where, with few exceptions, the actual construction of all works has been in departmental hands, the supply of materials

etc., only being more or less under petty contractors. My experience, however, of the actual control of works ceased in 1899, and it is, I believe, a fact that even in the *mofussil* there has been considerable extension of petty-contract work since that time, while in Bombay it is, I think, the custom for practically all work to be done by petty-contract. I use the word "petty-con-

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tract" in the sense that such contracts generally apply to the construction of works of no great magnitude, though such works include buildings of a considerable size, and do not include important works requiring a considerable amount of plant, or constant engineering supervision, such works being even now generally carried out departmentally.

(2). The point on which evidence is required appears to be the possibility of extending the practice of carrying out works by contract. The consideration of this question involves a distinction being drawn between large contracts, in which the contractor employs his own engineers to deal with the engineering details of the work, and who again arranges with his sub-contractors for the execution of sections of the work, and supplies all plant that may be required, and small contracts which I have referred to above as petty-contracts.

(3). As regards the first of these, I may say at once that the state of things in India is not sufficiently advanced for it to be possible to entrust such works generally to Indian agencies.

(4). I am not aware of any instances of government works of such magnitude being carried out except by departmental agency, but such works have in the case of local bodies been sometimes carried out by other agencies, generally by contractors' firms having their head-quarters outside India. It must be remembered that contractors are now to a great degree specialists, and that large firms do not confine their operations to any one country. They are almost always firms with a strong financial backing, are in a position to set off the loss on one work against the gain on another, and are in possession of large quantities of suitable plant for the execution of the special work which may be in hand, while having a staff trained in carrying out work under their own system. Even such firms are not always entirely satisfactory, as their establishment have frequently little experience of the class of labour they have to employ, while their methods of work are often strange to Indian labour and to the supervising establishment that they are able to obtain in India.

(5). The field of work in India alone is so restricted that no firm whose operations were confined to India would I think find it financially possible successfully to undertake the occasional work which might be obtained. I am strongly of opinion therefore that, at the present time, no extension of the system of contracts for such works is possible or desirable and that works of this kind must continue to be carried out by departmental agency. As regards other works, where conditions are favourable, I have no hesitation in advocating the extension of the system of executing work by contract so far as possible; but I am doubtful whether it will be found possible for contractors to employ their own engineering staff to deal with the engineering details of the work in most cases, nor do I think that an extension of the contract system would enable any large reduction to be made in the superior engineering establishment required for a proper supervision of such works; the reduction in the government establishment that would be possible would rather be in the subordinate establishment which is now employed in connection with the minor details of the work, and in the office and account establishments who have to deal with the large volume of correspondence and accounts necessitated by the practice of carrying out works departmentally.

155. (VII.) Education.—I am of opinion that the theoretical qualifications of men turned out from the government colleges are generally satisfactory but that their practical training requires considerable improvement. This fault is more or less inherent in all college education but the difference between English and Indian methods is this that, whereas in the former a theoretical training is considered as complementary to a practical training, the theoretical training and its resulting university degree is, in India, considered as the hall mark of an engineer. The necessity of practical training before any man can be considered fully qualified is now recognised in England by the requirement of the Institute of Civil Engineers, that men shall have at least two

years' practical training on works before they can be admitted as associate members of the Institute of Civil Engineers. There is in India nothing to correspond with the A.M.I.C.E., and any man obtaining his degree at one of the Indian universities now considers himself fully qualified as an engineer to design and execute works. There are certain difficulties in introducing such a system in India in that, while a student at home begins his training immediately on leaving school, it is necessary for a student here to put in at least one year at an Arts college affiliated to the University, after passing his matriculation, before he can enter an engineering college affiliated to the University. The result of this is that an English student generally passes his A.M.I.C.E., with its required practical training, at an earlier age than an Indian student obtains his theoretical degree.

(2). Under the present regulations of the Bombay University a student is required, after obtaining his necessary qualification in Arts, to put in three years at an engineering college before appearing for his B.E. degree. The demand for entrance to the engineering college has of late years been so great, from students who have considerably higher qualification in Arts than the minimum required and are consequently of a greater age, that the authorities have been able to fill their classes almost entirely with students having these higher qualifications. This, no doubt, results in the instruction on engineering being more quickly and easily assimilated and, with the 3 years' course at present required, does not possibly do much to raise the average age of the students who obtain their B.E. degree. A new course has now been approved by the Faculty of Engineering, and is under consideration by the Syndicate, extending over 4 years. Should this course be adopted it will to some extent prevent the rush there now is to cover the full course in the time allotted to it, and will lessen the importance of previous grounding in Arts colleges, and will probably render it possible to lower the general age of students on admission to the college. The course is a satisfactory one, in my opinion, on the whole, and attaches much more importance than before to such practical work as can be given in a college; but it cannot provide the necessary practical training in the execution of works without which no engineer can be considered as fully qualified.

156. (VIII.) Practical training.—The necessity for practical training as a qualification for the diploma granted to successful students of the Victoria Jubilee Technical Institute has been recognized by that Institution, and an effort was made to introduce a system by which a student after passing through his theoretical training would have been required to put in two years' of practical work before being allowed to appear for his final examination for the diploma whether in mechanical, textile or electrical engineering or chemistry. During this period of practical training it was intended that he should receive a living wage from the firm he was apprenticed to; but, though ample promises of support were received from mills and engineering firms when the scheme was first mooted, it was later on found impossible to obtain definite promises for the admission of a stated number of students each year. The scheme has, therefore, for the present been reluctantly abandoned.

(2). It is suggested that it is equally necessary that all engineers shall be required to have a certain amount of practical training before they can be considered as qualified.

(3). There are two ways in which this most desirable object could be obtained. The first, that the University should make it a condition of permission to appear for the degree of B. E., that a student had been apprenticed for at least two years to a recognised firm of engineers, or had been employed by a recognised local body and had been actually engaged during that time on engineering construction, or partly on construction and partly in the office; while the second would necessitate the institution of some associations to whom the right

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would be given to confer a further degree without further examination on students who had obtained their engineering degree at the University and had complied satisfactorily with the conditions as regards practical work, or with examination in the case of students who had obtained the necessary practical experience but who had not obtained an engineering degree at the University.

157. (*General.*) I should like to remark on the great improvement there has been since qualified architects

have been employed to design and supervise important buildings, and to express a hope that this specialization may be carried as far as possible, not only as regards architecture but other branches also, such as sanitary engineering.

(2). The Public Works Department has in the past undoubtedly suffered owing to the want of specialists, but it is not only in the Public Works Department that the same fault is to be found in India, but in private practice as well.

SIR F. L. SPROTT called and examined.

158. (*President.*) The witness stated that he was the Chairman of the Bombay Port Trust, and had held that post for about six or seven years. He was a member of the Public Works Department, and was holding the rank of Chief Engineer in that Department.

159. The range of the operations conducted by the Port Trust was a very wide one, and works of varying magnitude were constructed by them. As examples of large works he instanced the new dock completed nearly three years ago and a scheme, recently completed, which involved the reclamation of some 600 acres. Some of the subsidiary works undertaken in connection with these projects were also on a very large scale, and numerous smaller works were required for their maintenance and development. The Port Trust constructed their own buildings and railways, so their experience of work was very considerable.

160. The Port Trust utilized nearly every known method for the execution of work. The docks referred to had been constructed by a big firm of English contractors, the reclamation work was carried out departmentally, while the major portion of the subsidiary works was given out on piece-work. Large firms of English contractors maintained their own staff, but usually gave out sub-contracts to Indian contractors. A certain amount of work was done by them by the direct employment of labour, but piece-work was the system usually adopted.

161. It was extremely difficult to say whether contract or piece-work was the more economical; it depended entirely on conditions. For ordinary work, such as is generally carried out in India, he was strongly in favour of a considerable expansion of the petty-contract system, under which the supply of both labour and materials would be entrusted to the contractor, the supervision of the work remaining in the hands of the departmental engineer.

162. He was unable to say how many contracting firms were established in Bombay. Those employed by the Port Trust maintained no engineering staff of their own, employing only *mistris* to supervise the work.

163. It was extremely difficult to compare the cost of the work undertaken by the Port Trust with that undertaken by the Public Works Department, as the character of the work was entirely different. He was unable to furnish any information with regard to works executed by private enterprise in Bombay, but considered that there was undoubtedly sufficient work available in the presidency town to admit of the establishment of a certain number of firms of building contractors.

164. The statement made in his written memorandum that works belonging to local bodies had sometimes been carried out by other than government agency, generally by contracting firms having their headquarters outside India, referred to such bodies as the Port Trust, and not to municipalities and local boards.

165. The witness considered that, even if the system of giving out work by contract was extended, there would be little reduction in the cost of the government supervising establishment, though some economy might be effected in office work and accounts, and perhaps in the subordinate establishment. Effective superior supervision would still be as necessary as ever.

166. Turning to the question of engineering education in India, he had been a member of the committee which had recently considered the engineering courses in the Poona College of Engineering, and which had recom-

mended a new course of four years' duration in substitution for the present course of three years. He agreed that students left college too late in life, and stated that the average age at which they did so was much the same as the age at which men came out from England having completed their practical training. The committee previously referred to had, however, not considered this question.

167. In regard to the suggestion that the standard of education required for entrance to Poona College should be lowered, so that a boy could be admitted direct from school instead of after one or two years in an Arts college, and that the courses in the college should be altered so as to include not only engineering subjects but also a certain amount of general education, he considered that there were, perhaps, advantages in such a proposal although it was by no means free from difficulty. He agreed that men did waste a considerable amount of time in the Arts colleges on subjects which would be of no use to them as engineers, but the instruction which they obtained in English was of great importance to enable them to follow the lectures in the engineering college. It might, however, prove feasible to combine the two courses to some extent, admitting matriculates to the college, and giving them a certain amount of instruction in English while there.

168. He considered that the provision of a two years' course of practical training for students on leaving college might be arranged for, but was very doubtful whether the University would agree that this should be a condition for the grant of a degree. There would, however, he believed, be no insuperable difficulty in establishing an additional diploma, similar to the A.M.I.C.E., which would serve as a mark that the student had received a practical training; the diploma might be given by some association such as the Civil Engineers' Association, which would have to be endowed with the necessary powers. He was not aware that there was a Civil Engineers' Association in Bombay, but there was certainly one for the whole of India. He had had personal experience, on the Port Trust works, of five or six men who had graduated from the Poona College, and considered that after they had had two or three years practical training they turned out fairly well for the most part, although they were useless when they first left college.

169. With regard to the suggestion that further specialization, should be permitted during the college course he stated that, although the suggestion sounded attractive, he did not personally think that there was yet a sufficient field for specialization in India. There was certainly none in private work, and in government work it existed to a limited degree only. In the case of electrical and sanitary engineering there was little demand for engineers with such qualifications, the main need being for electrical foremen and men of that type.

170. There was something in the suggestion that the theoretical course for upper subordinates in the Poona College might be cut down, and his own experience of the men employed by him undoubtedly showed that they learnt more theory than they actually needed. Under the Poona system, however, where engineers and subordinates were trained together, it would be difficult to divide the course, as it was only at the end that it was known which men would enter the provincial engineer and which the upper subordinate service. At

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present the only differentiation was that between the engineering class and the lower subordinate class.

171. It would be possible for the Port Trust to take for practical training, a certain number of graduates, who were not destined for government service, and places could probably be found for two men a year. A similar scheme had been proposed in the case of students from the Victoria Jubilee Technical Institute, but had failed to mature owing to the difficulty of obtaining a definite agreement from firms to employ a certain number of men and to pay them a living wage during their apprenticeship. The cause of failure lay rather with the employers than with the apprentices because, although when the scheme was first mooted a considerable number of firms had expressed themselves willing to take the students and pay them a wage of Rs. 30 or Rs. 35 a month during a two years' apprenticeship, they refused, when the time came, to give any definite assurance to that effect. This scheme had no connection with the training of civil engineers. He considered that if a two years' course of practical training could be arranged it would be necessary to give the students a living wage during their apprenticeship, as a very large proportion of them were extremely poor and would hence be unable to meet the cost of the training themselves.

172. (*Mr. Cobb.*) The University regulations laid down that students should take a portion of the Arts course before entering the Poona College. After spending two terms in the college, and passing an examination satisfactorily, students were allowed to take up specialist courses, but one year in an Arts college was necessary before this might be done.

173. There was a considerable difference of opinion on the question whether the practical training should follow the theoretical training or be sandwiched into the college course. Personally he thought that it was doubtful whether by the latter method students would reap the full benefit of the practical training though he recognised that they would more readily assimilate their theoretical training if they had some practical experience. The system might, however, prove useful in giving the students some practical knowledge of machinery, which was entirely lacking in the present graduates, and would enable them to get a better grasp of the theoretical work.

174. Before taking the University course these students were, for the most part, educated in high schools. He considered that seventeen was about the correct age at which they should leave these schools, but they would have acquired little more than a smattering of English by that time. Occasionally a man was found who could speak fairly fluently at this stage, but his knowledge was usually of a somewhat parrot-like description.

175. (*Rai Bahadur Ganga Ram.*) The Port Trust had engaged the firm of English contractors previously mentioned because the construction of the docks was beyond the scope of any Indian contractor, especially in the matter of plant. The English firm did not belong to a single individual but to a group of capitalists, so that it had a very strong financial backing. The contract amounted to nearly Rs. 3,00,00,000. He was unable to say how much of the profits went to the sub-contractors employed by the firm, nor could he say how the rates given compared with the ordinary local rates. Such a comparison was, indeed, impossible, as the circumstances were entirely different. The contractors themselves undertook such items as pumping, drainage, insurance, etc., and sub-let those for ordinary excavation, building, supply of materials, etc., to their petty contractors. Tenders were called for before the work was commenced, but no Indian firms tendered for it.

176. The Port Trust maintained a staff for the departmental execution of work. The percentage of the cost

of establishment to the cost of work varied considerably from year to year, but he had been accustomed to provide about 5 per cent. in his budget for capital works for his engineering establishment, excluding that of his Secretary. This percentage had sufficed so long as large capital works were in progress, but it was now no longer sufficient. The percentage was intended to include the establishment employed on design as well as that actually employed on construction.

177. He had not recommended lowering the standard of education necessary for admission to the Poona College to the matriculation standard. All he had said was that he thought that the present system, whereby students remained in the Arts colleges until they passed their B.A. or Intermediate Arts and then went on to the Poona College, involved waste of time. The minimum time laid down by the University, viz., one year in an Arts college after passing the matriculation, was suitable, but he understood that a very large number of men who entered Poona College had already passed the B.A. examination, which entailed three, and possibly four, years in an Arts college. It was very desirable that students should get to their work in the engineering college as early as possible. He was aware of the practice obtaining in medical colleges, where students entered after taking their B.A. degree and then went through a five years' course, at the end of which they began life as assistant surgeons on Rs. 100 per mensem, but his own experience in Bombay had been that anything which tended to lengthen the college course was always very strongly opposed.

178. It would be possible to get the A.M.I.C.E. papers sent out from England, but he did not think that that degree was generally known in India and thought that one conferred by an association in India itself might be preferable.

179. (*Mr. Mackenzie.*) All over the world officers were useless until they had acquired a certain amount of practical experience. This experience could not be obtained merely by going about on works and taking notes; a sense of responsibility was also necessary. This subject was fraught with difficulty; on the Port Trust works, for example, if a man undergoing practical training were given a responsible post he would require very careful supervision, and hence the Trust could not afford to give any great responsibility to a candidate under training. It was extremely difficult to formulate a satisfactory method of giving students a practical training sandwiched into their college course.

180. There was nothing professional about the Civil Engineers' Association, to which he had previously referred; he had merely instanced it as a body which was in existence, and which might possibly be developed.

181. (*Mr. Kent.*) The figure of 5 per cent. allowed in his budget for establishment was certainly a much lower figure than that at which the Public Works Department could execute works; the reason lay probably in the fact that the Port Trust works were usually concentrated, and on a very large scale.

182. It would, he thought, have been possible for the Port Trust to have executed the Alexandra Dock with their own professional staff aided, perhaps, by experts from England, though there would have been difficulty in regard to plant. The Port Trust had carried out its big reclamation scheme with its own staff, but had had to procure special plant for the purpose.

183. (*Rai Bahadur Ganga Ram.*) It was true that the Port Trust carried out certain classes of work, such as road making, which were of a similar nature to those carried out by the Public Works Department in Bombay, but he was unable to say how the Port Trust rates compared with those paid by the Public Works Department,

W. F. STUART-MENTETH, ESQ., M.I.E.E., A.M.I.C.E., Electrical Engineer to Government, Bombay.

Written Statement.

184. (*Qualifications.*) I was educated in England, took an engineering diploma at a technical college, was apprenticed

to a firm for three years in London, then came to India as engineer for a large tea company. In 1897 was appointed municipal engineer at Darjeeling. In 1903 was appointed municipal engineer at Lahore. In 1905 joined the

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Public Works Department as a temporary engineer, was attached to the Secretariat on a large reclamation scheme for a short time; tentatively held charge of a division in the Roads and Buildings Branch; subsequently was engaged on electrical work directly under the Chief Engineer and now act in the capacity of Electrical Engineer and Adviser to Government; with the status of an Executive Engineer, and a division comprising the whole presidency. I have had 19 years' engineering experience on civil and electrical works in India, of which 10 years have been spent in the Public Works Department.

185. I have been indirectly connected with the Secretariat for 7 years and have held charge of an Executive Engineer's division for 2½ years. As I joined as a specialist, my experience of the routine and methods of the Roads and Buildings branch of the Public Works Department is limited as my work has been done directly under the Chief Engineer. My remarks therefore are governed by that relationship and are principally confined to electrical works.

186. (I.) **Economy and suitability of methods of execution of public works.**—In the first instance we endeavoured to carry out all works by local firms. The experience was not satisfactory; we found it to be more satisfactory and much more economical to do work departmentally, purchasing the material from local firms; this applies to repairs also. We found repair work most expensive and the quality of the work bad and unreliable. We have to maintain establishment to run plant installations; we have also to maintain electricians permanently for night and day work on certain important buildings, such as hospitals; these men we have gradually trained and we have a hold on them; we employ them therefore on new works and can rely on the work being carried out properly. Through having an establishment of skilled workmen we are in a position to do better work than contracting firms who engage fresh establishment, which is generally untrained, for each work. Departmental work is also more economical as we not only save contractors' profit and contingency charges, but we save on subsequent repairs and additions by being able to utilise the large quantity of wastage material of a work. Our establishment is also in a position to carry out the many alterations and additions which every installation continually requires promptly which, if attempted by other agency, would involve delay and be very much more costly. The method adopted for electrical work is undoubtedly the most economical and reliable for the prompt execution of works. We could, however, effect greater economy which would at the same time encourage local enterprise if restrictions on local purchase were removed. We find it very difficult to work an estimate when purchasing through the Director General of Stores. There is no question that local firms would welcome and benefit by the withdrawal of these restrictions. It would also encourage British firms to open branch offices in India which is a great want that I have been striving for in connection with this presidency. (Attention is invited to the instances quoted at the end of this statement.)

187. (II.) **Encouragement of other agency.**—I can speak with some assurance on this matter in connection with civil engineering works, having had experience as a municipal engineer. While municipal works are carried out generally at cheaper rates than those of the Public Works Department I have no hesitation in saying that such work does not compare in quality with that of the Public Works Department. My experience of municipal work is that conditions absolutely preclude reliable and first class work being carried out. This applies to roads and sanitary building work as practically no local boards or municipalities are in a position to do any electrical work. The work of a municipal engineer's office has to be experienced to be understood, and the difficulties the engineer has to contend with in India are unlimited and insuperable, and bear no comparison with any other country in the world. To attempt to dismiss contractors or establishment for bad work is more likely to result in the dismissal of the

municipal engineer. Minor repair works a municipality might undertake; they would undoubtedly welcome anything that would bring in extra expenditure, but the quality of the work would not compare with that of the Public Works Department and in point of economy it would certainly result in a small saving on one hand and greater loss on the other.

(2). When electrical work was commenced it was given out on contract to local firms; in many cases, however, although this work was executed at exorbitant rates, the results were so unsatisfactory that government was involved in considerable loss which resulted in orders being passed to discontinue giving work to certain firms. As far as electrical contract work is concerned therefore we have done our utmost in this respect. Mushroom firms abound but electrical work must be done by skilled labour and such labour is very limited in India; we are now trying to meet this labour difficulty by licensing electricians. In electrical work, more than any other, unskilled work rapidly yields disastrous results. We had an important installation done under contract by a local firm in 1913 which has not even survived its completion, and consequently has not yet been taken over. The work will have to be redone eventually by government. The work was given on contract to encourage and assist the firm although it could have been carried out directly by government.

(3). To encourage local electrical enterprise we must encourage "turn over", that is, sale of material, in the first instance, by local purchase and by standardising pressures of supply so that stocks are not too varied. Local firms only undertake contract work with a view of selling their material, they prefer to sell the material direct rather than undertake the erection of it.

(4). As regards electrical work which is of a special nature, it is quite impossible to employ local boards for construction or maintenance of such works.

188. (IV.) **Relations with other departments and sub-branches.**—The electrical branch of the Public Works Department does work and gives assistance freely to medical and educational departments in connection with their electrical apparatus, and experience shows that it would be more economical for government if such departments made greater use of the expert knowledge of this office in such matters.

(2). The relations between sub-departments of the Public Works itself are satisfactory but possibly might be improved if the Department was organized on a different basis, so that the heads of various branches were in a better position to meet and discuss matters personally. The only instance I know of conflicting interests affecting work is in the case of the Telegraph Department which is an Imperial department with the monopoly of telephone work for all India and thereby prevented the introduction of a most useful system of telephone inter-communication in a government office.

189. (V.) **Decentralization.**—The operations of the Public Works Department comprise all branches of engineering, the principle of which come under the following heads:—

Irrigation;
Buildings and Roads;
Electrical Works;
Sanitary Works;
Mechanical and Water-Works.

These branches centre in two Chief Engineers, the Secretary to Government, and the Joint Secretary to Government. Either one or the other of these officers has to be an expert therefore in branches of engineering with which he may not have any experience and therefore has often to decide on points in which his own experience cannot guide him. These branches should, I think, be separately represented and should be collectively under the Chief Engineer and attached to his office so that he has at his immediate disposal experts in each branch; these experts should be Chief Engineers of their own branches and deal direct with their own Executive Engineers. They should have mechanical, electrical or sanitary laboratories and complete libraries

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at their disposal, and every possible facility should be provided so that these officers are always up to date and thoroughly expert in their respective branches.

(2). Executive Engineers should be given greater powers than at present, and should be relieved of account work. An Executive Engineer at present is unduly hampered with a tremendous amount of office and account work, so much so that he practically becomes a clerk instead of an expert engineer. In my own case accounts matters involve my signing my name at least 1,200 times on various forms, etc., every month in a period of fourteen days. This practically ties me to my office table at headquarters and prevents my giving necessary and important close supervision to works in the presidency; this has directly resulted in great loss to government. The Executive Engineer should therefore be relieved of all account work and have under him an accounts officer solely responsible for such work. At present a mass of accounts have to be sent to the Accountant-General twice in each month purely for audit purposes. This represents an enormous amount of labour involving endless correspondence which could be avoided at a great saving to government if the accounts were frequently under audit by travelling auditors as done in the case of municipalities. In my own case about 50 per cent. of my time would be saved to government if this course was adopted; it would react at once in increased efficiency of establishment and improvement in work generally, through being able to exercise more supervision.

(3). I can only say that having worked as an Executive Engineer for some time I do not yet know all the Code rules and hope I never shall have to. To attempt to analyse the Code in detail is quite impossible, I should like to see it entirely abolished and a new system introduced based on commercial practice. I consider much wider powers should be given to an Executive Engineer. He should be able to sanction estimates up to Rs. 10,000 and accept tenders up to Rs. 25,000 and should also be given a discretionary grant up to Rs. 10,000 to enable him to execute minor works promptly. In my own case petty original works have to be referred to government for funds, the delay involved is always a source of irritation and inconvenience, frequently the administrative expense to government of sanctioning such funds exceeds the cost of the actual work.

(4). The Executive Engineer should also be given wider discretionary powers in executing works generally by modifying rules 761, 329 (1), 312, 782, 1056.

190. (VII.) Education.—As regards electrical work the system of education appears satisfactory but the difficulty is that the classes who are able to take up theoretical engineering training in India are not those that make engineers. The electrical engineer has first of all to be a practical man, able to do work with his own hands and show others how it is to be done. The bulk of students that attend the colleges have no practical ability whatsoever, never will and never can have it; consequently, these students after qualifying are suitable for purely clerical or educational work only. The capable, practical engineer is to be found in the uneducated classes, and I have had many instances of such men who, if they had been able to acquire theoretical training as well, could have risen to high appointments. On the other hand I have had innumerable instances of the educated classes who have taken high degrees in engineering both in India and Europe who had absolutely no aptitude for engineering work whatsoever. Education in the former case is most necessary while in the latter case it is absolutely wasted.

191. (VIII.) Practical training.—It is very difficult to know how to meet these conditions, but I think a system of practical training in workshops with evening classes should form the preliminary qualification for entry into technical colleges. It is necessary to assure that the student has practical ability before he receives theoretical training as an engineer for electrical works. In my opinion, 90 per cent. of the students who go through technical and engineering colleges at present are entirely unsuited for engineering work.

(2). The educational authorities seem to consider that the practical training which they give students in a college is adequate for making them qualified engineers; this seems to be the principal fallacy of the system; the practical training the student obtains is valueless. I speak from personal experience of the practical training I received myself at the principal technical college in London as compared with the subsequent training I received as an apprentice. Practical training can only be acquired in large engineering works, and government should provide that prospective engineering students can obtain such training by apprenticeship through a complete course in railway workshops and large manufacturing firms; this course should be prescribed so that the student obtains experience in all branches and is not merely tied down to a lathe or a vice for the whole period of his apprenticeship. A student should also enter as a paid apprentice and not as a pupil, and be liable to immediate dismissal for obvious incompetence.

192. (General.) In connection with the engineering establishment of the Public Works Department, I would invite attention to the conditions of service of temporary engineers under covenant, appointed by the local Government, as compared with the Imperial engineers appointed by the Secretary of State. The qualifications of such engineers may be as good or better than those of the Imperial engineer but the conditions of service and emoluments bear no comparison. Taking my own case as an example, after 10 years' service with the local Government spent in organizing and developing an entirely new branch of engineering, my emoluments are 17 per cent. less than those of an Imperial engineer, and I receive no pension or provision for retirement. The local Government cannot itself appoint a temporary engineer without the sanction of the Secretary of State, and it has happened that, after engagement on certain definite terms by the local Government, the Secretary of State has, some considerable time after engagement, modified and amended those terms. This could not possibly occur in commercial or any other service. I consider therefore that the local Government should have absolute authority to appoint temporary officers at once and on terms uniform with those of the Imperial engineer if the qualifications of the officer justify it.

(2). There is no question that the Public Works Department is a highly organised engineering department with many brilliant engineers, but it is noticeable that they have only made a mark in the engineering world in one branch of engineering, namely, Irrigation. Some of the best engineering ability of the Empire undoubtedly enters the Department and apparently dies there without any marked result. In this respect the Department seems to be responsible for the loss to some extent of a valuable national asset. The fault, in my opinion, lies in the system and organization of the Department. The system enables an engineer, after having joined, to sit tight in his appointment and to rise automatically until he receives his pension doing only such work as he has to do. He has no incentive for original work or to keep up to date in his profession. He has only to study his code and account rules and conform to them, and his future is assured, unlike the engineer in the open market whose future prospects depend on his working continually, studying and keeping in touch constantly with modern progress and pushing himself by sheer ability through a crowd of competitors.

(3). The Department seems to suffer from over-organization. It is analogous to a large mill of many units mechanically driven by chains of geared wheels, in which the output and cost of work is high through losses in gearing. In such case modern progress would demand each unit should be separately driven with electrical energy direct from the source of supply. Reorganization on analogous lines in the Public Works Department would undoubtedly add to its efficiency. The engineers should be given more responsibility and incentive for original work; advancement should be by shown ability: the Code and account rules should be scrapped and an entirely new system based on modern methods

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introduced. The engineer would then be able to leave the Department as an engineer and find employment elsewhere. The present system practically ruins the Public Works engineer for any employment outside the Public Works Department.

(4). The future progress and development of India demands a body of skilled engineers which the country itself cannot possibly supply at present, and is unlikely to be able to supply for some generations to come. The Public Works Department is the best means of supplying that need if properly reorganised. Devolution of engineering works at present to local bodies will, in my opinion, be uneconomical, unsatisfactory and a retrograde movement that will retard the development of the country.

Cases of loss and delay in ordering material through the Director General of Stores.

1. In February 1915 we indented on the Director General of Stores for laboratory equipment estimated to cost £1,229. The indent comprised electrical plant, switch boards and instruments. The Director General placed the whole order with a firm that manufactured electrical plant only; this firm then sub-contracted the rest of the order with a firm that made switch boards only; this firm in turn again sub-contracted with an instrument manufacturer for the supply of the instrument portion; the result was that the Director General's quotation amounted to £2,610 exceeding the cost

of supply by a local firm by £1,139; that is it doubled the cost of the work; the material has not yet been supplied.

2. Batteries of a certain make were ordered in 1912. The Director General supplied batteries of another make which could not be utilised and contended that these batteries were identical in all respects with those that had been ordered but afterwards admitted and regretted his mistake. Batteries were then ordered and supplied locally which involved government in a loss of nearly Rs. 4,000 and several months' delay.

3. Switch boards ordered through the Director General of Stores in May 1912 arrived broken and 1½ years expired before their replacement was effected.

4. A Cooper Hewitt printing machine was ordered from the Director General of Stores; on arrival, one lamp was broken, the cost was borne by this office; a new lamp which was then ordered was again broken and the cost again borne by this office. Lamps were then ordered from a local firm and supplied intact within three months. A delay of nearly two years occurred through this order being placed with the Director General of Stores.

5. A motor pump estimated to cost £60 was ordered through the Director General of Stores; intimation was received that the cost would exceed the estimate by £165; the pump was purchased locally for £62.

6. Motors for printing machines estimated to cost £41 were ordered through the Director General of Stores; a cable was received intimating that the cost would be £108; the motors were then purchased locally at half the Director General's cost, namely £54.

MR. W. F. STUART-MENTETH called and examined.

193. (*President.*) The witness stated that he had been Electrical Engineer to the Government of Bombay for the last ten years. He had taken a college diploma in electrical engineering in England, and had specialized in that subject although, in the earlier years of his service, he had done a certain amount of civil engineering. His work consisted in erecting and maintaining all electric installations pertaining to government buildings, and in giving advice to government in connection with schemes which necessitated the issue of licenses under the Electricity Act, since he acted as adviser to government in regard to the administration of that Act and of the rules thereunder. His work extended throughout the Bombay Presidency and included also the installations in Aden and Sind. There were installations, mostly government property, in Karachi, Belgaum, Jalgaon, Ahmedabad, Mahabeshwar, Poona, Rajkot, etc., which were in the direct charge of electricians, engaged on a temporary basis, and over which he exercised supervision.

194. There were very few electrical firms, either for contract work or supply, in Bombay. He could think of four only. Even these maintained no qualified staff capable of undertaking the erection of an installation. The weakness lay in the supervising staff; in general the men employed were qualified to manage the work in the head office, and nothing more, although there might, perhaps, be one man qualified to supervise work in out-stations.

195. It was very difficult to say how the cost of installations put up by government compared with the cost of those put up in private buildings in Bombay or elsewhere because not only the rates, but also the quality of work, had to be compared. Electrical installations in government buildings differed entirely in quality from those erected in private houses. The former generally cost from twenty-two to twenty-three rupees per point, while there were firms in Bombay which would carry out an installation in a private house for ten to twelve rupees per point. In one case, however, the work was permanent, while in the other it would probably require re-doing within three years. Government had often to redo work executed not more than three years previously in bungalows which they took over.

196. He had had no experience of municipal work for the past eleven years.

197. Referring to the rules regarding the purchase of stores, the witness stated that it took much longer to get stores through the India Office than to get them direct

from firms in England. In the latter case they could be obtained in two or three months, while if the India Office were indented upon there were indefinite delays. He instanced the case of an indent which had been sent two years ago and had not yet been complied with, thereby stopping a most important work. It was true that the war had delayed matters, but a local firm could have obtained the material in a much shorter time. He did not attach much value to the inspections done by the India Office. When he was at home he had made inquiries at the office of the Director General of Stores regarding inspections, and had found no case in which any examination or inspection had been carried out by the Stores Department which could not equally well have been carried out in India. Firms in India not only supplied exactly according to specification but also undertook the responsibility that what they supplied was in order, whereas, in the case of materials or plant obtained direct from England, there was always considerable trouble in replacing anything broken *en route*. Increased local purchases of stores would certainly tend towards the establishment and development of firms in India. At present the Director General placed all orders for electrical materials with certain firms in England; if local purchase were encouraged those firms would have to come to India to get their work. There was, he considered, sufficient scope in India to admit of competition among electrical firms, as work of that nature was developing rapidly.

198. With reference to the system of licensing local electricians which he had suggested with a view to improving the quality of the work turned out by them, the witness stated that in Bombay the main difficulty in the execution of electrical work and the maintenance of installations was the lack of skilled labour. In order to obtain a class of qualified workmen it was necessary to license such men as skilled electricians. In New Zealand certain qualifications were required before a man could be granted a license to work as an electrical labourer, and he advocated a similar system for India. Only men holding such licenses could be employed on works. No new legislation would be required. The question had been discussed at the annual electrical conference, held in Calcutta, and it was there decided that such a measure could be enforced under the Indian Electricity Act. The Bombay Lighting and Tramway Companies had also complained in regard to the want of skilled labour, and had suggested that some such system of registered contractors or labourers should be introduced.

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199. In regard to the suggested reorganization of the electrical branch of the Public Works Department to which he had referred in his written memorandum, he considered that the Electrical Engineer to Government and his staff should be a branch of the Public Works Department and agreed that the branch should be under the orders of the Chief Engineer. He admitted that this was more or less the system at present in force but advocated its extension so as to embrace all specialized branches, such as the mechanical, sanitary, etc. The Irrigation and Buildings and Roads Branches should, in his opinion, be separated, and the Chief Engineer in the latter branch should have under him an expert in each specialist sub-branch. Such experts should be at headquarters to facilitate discussion and reference on inter-connected subjects. This was already the case in regard to the Electrical Branch but not to the Mechanical, Architectural, Roads and other branches. His idea was to have each of these branches under a specialist who in turn would be under the Chief Engineer. In other words, that the Chief Engineer should preside at a Round Table of experts, so that, in considering any large project, these experts could readily suggest improvements in the project. It would be necessary to co-ordinate these separate branches by placing them under a single head. (Mr. Kent here explained that there were two Secretaries, one for Irrigation and the other for Buildings and Roads. The Buildings and Roads Secretary dealt also with electrical and railway matters. The senior of the two dealt with establishment questions. There was only one electrical expert and that was the present witness. There was a single Consulting Architect who also was under the orders of the Chief Engineer and Secretary to Government, Buildings and Roads. The same was the case with the Sanitary and Mechanical Engineers.)

200. The burden of work thrown upon him by the accounts system was very heavy and considerable relief was required. As a municipal engineer he had never been hampered by a mass of accounts. Municipal accounts were done by the accountant, who was absolutely responsible for them. At present, although there was an accountant in his office, he had to initial everything that the accountant did. He suggested that the accountant be empowered to deal direct with the audit office in such matters, and that the accounts branch be entirely separated from the executive branch; if the Executive Engineer wished to see how his works were progressing he could always call for the accounts, but the work of book-keeping and compilation of which he complained could be done as easily by the accounts officer as by the Executive Engineer. At present he had to sign and send a mass of forms to the Accountant-General at various intervals for audit purposes. His signatures, in most cases, were a pure formality and a waste of time which should be spent on technical work, and if a system of travelling audit were introduced the above could be dispensed with. The present travelling audit was simply an office inspection combined with a check audit. The monthly accounts should be done away with and travelling audit should take the place of the present system, the accounts, instead of going to the Accountant-General's office at the close of each month, being audited from time to time in the office in which they were prepared.

201. There was considerable difficulty in working in accordance with the provisions of the Public Works Department Code especially when work had to be executed urgently. He had no discretionary grant from which he could incur outlay on urgent requisitions, and this sometimes occasioned considerable delay and unnecessary expense. So far as he knew the Chief Engineer, under whom he worked, had no discretionary grant for such purposes. In regard to paragraph 761 of the Public Works Department Code which dealt with the acceptance of tenders and of which he had complained, he considered that if the Executive Engineer were competent to execute the work he should be empowered to frame and accept tenders for it. His powers in this respect should therefore be considerably enlarged. He did not wish to create the impression that that portion of the paragraph which necessitated the submission of tenders

of an unusual character to higher authority had been too narrowly interpreted by his superiors; he had merely, in his written evidence, enumerated such clauses as might in his opinion suitably be modified so as to give more power to the Executive Engineer. The sending of documents to government entailed delay which could be avoided by conferring upon Executive Engineers the larger powers he had referred to. In regard to paragraph 1056 which laid down that no work might be undertaken in the workshops of the Department other than work required for the various branches of the Department, except under some general or special order of the local Government or Administration, he thought that the rule was unnecessarily restrictive. To quote an instance an electrical apparatus belonging to the Medical Department went wrong, and he repaired the apparatus at their request. The Accountant-General raised the objection that it infringed the rule, although it was done by one government department for another. He did not know what the object of the rule was; in the case in point there was no electrical engineering workshop in Bombay which could have done the work. There were electrical firms which took up a certain amount of repair work, but they could not have repaired medical apparatus of the type referred to.

202. He considered that both preliminary and general education was over elaborated in India, and he often found that students who came to him from the technical colleges, although having received an elaborate education, had no aptitude whatever for practical, mechanical or electrical work, whereas the first essential for an electrical engineer was that he should be able to use his hands. The Victoria Jubilee Technical Institute held classes in electrical engineering, and there was also a course in electrical engineering in the Poona College of Science. He had had experience of students from both these institutions, and considered that neither was sufficiently practical. Consequently, although the theoretical training of the students was sufficient, they were unable to apply it in practice. He had found some excellent practical men among the uneducated Indians who, if they could have obtained a better education would have attained to much higher positions, but such men could rarely read or write. The remedy, he considered, lay in an improvement of the preliminary education. Youths should be allowed to go to workshops and become apprentices, and, after qualifying as practical men, they should then go to the technical colleges. He knew of no system of night classes in Bombay, but considered that it would be a great advance if such classes could be instituted.

203. Practical workshop training in Europe was given both before and after the college training. He could not say definitely which system would be the more advantageous in India, but thought that practical training before the college course would perhaps be better as showing whether the students had aptitude for practical work or not.

204. In regard to the conditions of appointment of himself and of other electrical specialists, the witness stated that he had been engaged on a temporary basis, on a fixed salary and for a fixed number of years. He considered that he should be brought on to the permanent list; it was an anomaly that while he was temporary some of the men of his own establishment were permanent. He did not think it was fair that specialists should be engaged on less favourable terms than civil engineer officers appointed by the Secretary of State at home. If the qualifications of the former justified their selection, it appeared unreasonable that the terms accorded to them should be so greatly inferior to those granted to the latter. Electrical engineers should be recruited and treated on exactly the same terms as the Public Works Department officers of the Imperial service, and the local Government should have power to appoint its own officers, without the delay involved in making references through the Government of India to the Secretary of State. Though his agreement expired at the end of 1915, the agreement for 1916 and onwards was still under consideration, and he did not know what terms would be decided

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[Continued.]

on eventually. He considered this a hardship and most unfair on an officer, and that the local Government should be empowered to re-engage an officer at once, on stated terms, on the expiry of his agreement.

205. (*Sir Noel Kershaw.*) Wherever there was a public supply government took its electricity therefrom and power stations were only built by government where there was an important installation and no public supply. Such plants were designed as economically as possible to meet the existing demand plus a small margin for future extensions. Government buildings only were considered and no supply was given to the public. The same policy was adopted in regard to Government House installations.

206. With regard to the question as to who should issue the licenses which he had suggested, the witness stated that under his scheme a licensed electrician or a licensed wireman would, in the first instance, obtain a certificate from the firm which employed him stating that he had been engaged on practical work for some time, and also a certificate that he had passed a wireman's examination, i.e., one from the firm and one from a technical institute. Licenses would be issued to these men by the Electrical Engineer to Government, or by government. As to why a man who already possessed one certificate from a firm and another from a technical institute should also require a government license, he stated that he considered it essential that some token of government approval should be given, since government would, under this system, have to satisfy themselves as to the man's qualifications. At present he could not get trained men at all, and it was possible for an ex-servant to go out and seek employment on electrical work. The whole object of the license was to obtain a class of skilled workmen, and he considered it necessary that a regular licensing authority should be constituted. Government issued certificates to inspectors of boilers and prime movers, and a similar system might be adopted with regard to electricians. These certificates would require to be renewed from time to time. The question of permitting municipalities to issue licenses had been discussed at a conference of electric inspectors, and the conclusion arrived at was that it would be hopeless at present to give that power to municipalities, and that it would be better to recognize only government certificates. In London, a certificate was given by the City and Guilds for wiremen's classes, but this did not preclude other people from working as wiremen, and there was no necessity to base the certificate on the result of an examination. If licensed labour could be got, the next step should be to get licensed contractors and compel them to use licensed labour. He would not however make it a condition that they should use none but licensed labour. It would be sufficient if the foreman engaged on an installation were licensed, to ensure the employment in that capacity of a man who knew the rules of construction and the main principles on which the work should be carried out.

207. In reply to a question as to what he meant by the term "commercial practice" when he suggested in his written evidence that the Public Works Department Code should be abolished and a new system introduced based on commercial practice, he explained that he would place the Executive Engineer in the same position as that in which the manager of a branch firm in India is placed, with considerable responsibility, and able to do a great deal more than he could do under the existing rules. At present the Executive Engineer had little or no power of initiative without reference to the Superintending Engineer or other superior officer. As to whether he had worked out any scheme based on commercial practice, which kept in view the fact that commercial firms need look only to their own interests whereas the Executive Engineer was working always in the public eye, he stated that he had not done so but suggested, as a single instance, that instead of having to account for his expenditure under eight different heads the Executive Engineer should carry out his work under two heads only—repairs and original works—and leave the further allocation to be done by the accountant.

208. (*Mr. Mackenzie.*) With regard to a proposal put forward that the Government of Bombay should employ a government buyer, not an official but a man of business who could act on their behalf as an agent for getting supplies of stores, etc., he considered that it would be a very much quicker, more satisfactory, and easier method than that of indenting on the Director General of Stores. It was suggested that such a buyer could obtain tenders from firms both at home and in India, and that if any plant or materials were urgently required, he could cable home, get the tenders, and lay them before the purchaser who would be able to make his selection. A certain percentage would be paid to this agent who need not necessarily be a whole time man, but one in trade and in touch with all the firms. He would be responsible for the goods being up to sample and government would get the very best materials possible and save themselves the trouble of calling for tenders from all the different firms. The witness thought that this procedure would be infinitely better than the present procedure, but did not think that this would be a better system than that of allowing the Executive Engineer to order direct from home or from firms in India, especially as it was sometimes necessary to make modifications during the execution of an order. He was not sure that better terms could be secured from firms in England through such a buyer than could be had from branch firms established in India, and he was desirous of seeing firms encouraged to come out to India and believed that if there were prospects of a sufficient turn-over they would do so. For this reason he suggested that the purchases should be made in India.

209. (*Rai Bahadur Ganga Ram.*) The witness stated that he obtained a diploma from the City and Guilds Central College. He was articled to a firm of hydraulic and electrical engineers in London, and did a certain amount of civil engineering work. He had taken a course in the City and Guilds for two years, and in the last year had specialized in electricity. He had been doing electrical work from the time he came to India. He was appointed municipal engineer in Darjeeling and thereafter was at Lahore for one year, but left the latter appointment because there was no electrical work there.

210. His main grievance in regard to his status was that the local Government was not empowered to fix terms for him. In his own case his agreement had expired a year ago and he had been working ever since without knowing what his actual position was. He thought that he would be even worse off than at present if, having been in government service for ten years, he were to leave it and start private practice, as experience and training in the Public Works Department were not held in high esteem by engineers in other parts of the world.

211. He was precluded from accepting any fees or commissions for private practice without sanction from government. He considered that if electrical engineers were allowed private practice as in the case of medical men it would add to their experience and increase their efficiency. He considered, however, that the concession should not be given in the case of subordinate officers of the Public Works Department as there was a danger of the privilege being abused, and quoted cases which had occurred in his own office where instruments had been smuggled out for private use by subordinates. He could give advice in regard to any electrical scheme which did not entail any expense to government, but before he could take a fee he had to refer the matter for sanction.

212. As to the suggestion that the Director General of Stores should be in India and not in England, he considered that it would be better and more expeditious than the present arrangement; but he still thought that the best method would be that of ordering the materials direct from the firm. As practically no electrical apparatus was manufactured in India he did not know whether, before indenting for an article on the India Office, any certificate was required that similar articles of Indian manufacture were not available in India. (Mr. Kent pointed out that such a certificate was required.)

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213. (*Mr. Kent.*) The witness explained that it was only in places where no electrical supply scheme existed that government would consent to put up a plant to supply government buildings with electricity. Government invariably took their supply from public supply companies, where available.

214. With reference to his remark in his written evidence that the administrative expense to government of sanctioning funds sometimes exceeded the cost of the actual work he stated that he was referring to the necessity for obtaining sanction for very small sums, sometimes only a rupee or two, for the execution of original works.

215. He maintained, as stated in his memorandum,

DR. H. N. ALLEN, B.Sc., Ph.D., Principal, College of Engineering, Poona.

Written Statement.

216. As far as the lecture room work is concerned I consider the present course for the B. E. degree of the Bombay University satisfactory for training engineers to meet the needs of private agencies, as well as of government.

217. It is felt, however, that far better results could be obtained if a larger amount of practical work, and particularly of workshop practice, could be included; and a proposal to increase the duration of the course from three years to four years, leaving the syllabus for the written papers practically unaltered, and requiring a considerable extra amount of practical work, has been approved by the Advisory Committee of the College, and by the Faculty of Engineering of the University. This will probably shortly be placed before the Senate of the University.

218. Up to the present there has been no special provision in the College of Engineering, Poona, for training men of the overseer grade, but the majority of our graduates have to take up work of this character. As a matter of fact, government appoints the candidate who takes the first place at the B.E. examination as Apprentice Engineer, and he rises to the higher grades of the provincial service automatically. They also appoint three passed B.E. candidates annually as overseers, and these men, who may only stand a few marks below the first man, cannot, under ordinary circumstances, rise above the rank of sub-engineer.

219. Many of the passed B.E.'s, however, attain the rank of engineer in the neighbouring feudatory states, with municipalities and local boards, and with private firms.

220. There certainly seems to be room for a three years' course, of a thoroughly practical nature, intermediate between the engineer's course and the sub-overseer's course, and the Advisory Committee have recommended that such a course should be introduced. A detailed syllabus for the same has been drawn up by the college staff, and will be considered by the Advisory Committee at their next meeting. It is considered that the amount of theory it is proposed to teach in this diploma course will be quite sufficient for the class of man it is proposed to train, and it is hoped that those who have been through it will prove more satisfactory assistants than those who, often with great difficulty, manage to pass, with marks approaching the minimum, the present B.E. course.

221. The sub-overseer course has recently been revised. It is exceedingly practical and is turning out a very useful type of man.

222. Presumably the proposed changes in the Public Works Department will not diminish the total number of men of the engineer grade required in the presidency, and there will also be openings for men who have taken the diploma course and the sub-overseer course, either under government or with contractors; so that any such changes need not be considered in connection with the proposed changes in the college courses.

223. Considerable extra expenditure will be necessary in order to introduce the new courses, both for additional staff and for extra accommodation and equipment in workshop, drawing halls, lecture rooms and engineering museum, if the work is to be done satisfactorily. It is

that government service had a somewhat deadening influence. As to whether he would be as valuable as he was if he were made permanent he replied in the affirmative, but pointed out that if a man rose purely by rotation and had no incentive to become proficient in his profession, it was bound to exercise a deadening influence on his work. In explanation he added that he did not make a grievance of the fact that he had not been made permanent, nor indeed was he particularly anxious for permanency. His only point was that local Governments should have power to appoint electrical engineers on suitable terms, without reference to the Government of India.

hoped that when the war is over, government will be able to provide the necessary funds.

224. It is proposed to start a school of architecture in Bombay, and to introduce a degree in architecture in the Bombay University. This is also being delayed on account of the war. Although no special instruction in architecture is now given in this college many of our graduates obtain employment in architects' offices in Bombay. When the degree is introduced the pressure on our accommodation here, which is evidenced by constant endeavours in the Legislative Council to increase the number of annual admissions, will, it is hoped, be somewhat relieved.

225. The college is able to attract a number of young men of considerable ability and, as the number of applicants is large, it is possible to select candidates whose educational qualifications are of such a nature that there is a probability of their being able to go through the course satisfactorily. With the proposed new courses there should be no difficulty whatever in obtaining a sufficient number of men of good ability to be trained as engineers and also men of sufficient ability for the diploma course.

226. It is hoped too that improvements in the high schools of the presidency will gradually make the men that come to us more practical. Until recently the education given in these schools has been very bookish, and many students are inclined to rank their memory above their intelligence.

227. The question of the training on works of our civil engineering students is a difficult one. Only the Apprentice Engineer appointed annually by government is formally given a course of training in the Public Works Department.

228. There is a feeling among the college staff that the overseers and sub-overseers should be regarded as being in training, when they join the Department, and that their superiors, while making them do their routine work properly, should regard them as pupils and, as far as possible, vary their work from time to time, so as to enable them to get an all round experience.

229. The note books sent in to the college periodically by the Apprentice Engineers, under government regulations, do not always show that the training of these young men is carried out by giving them work to do and seeing that they do it properly. A welcome change of method was noticed recently on the part of one Executive Engineer, who placed the Apprentice Engineer in his office for a month and made him do the work of the head clerk who had gone on leave. Too often the note books only seem to record that the Apprentice Engineer has a sort of roving commission to visit works in progress where he makes sketches and takes notes, but cannot be said in any way to supervise the work or to control labour. This was noticed when our new laboratory building was constructed.

230. It would certainly be a most excellent thing if all who go through the proposed engineers' course could be given a real working apprenticeship, either in the Public Works Department or with private firms, not as gentlemen of leisure strolling over works with a note book, but being placed under firm authority, and expected to earn a small living wage by hard work; being at the same time privileged to have a variety of experience.

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[Continued.]

DR. H. N. ALLEN called and examined.

231. (*President.*) The witness stated that he was the Principal of the Poona College of Engineering, with which he had been connected for the past 15 years, first as Professor and then as Principal. He was not a member of the Public Works Department but belonged to the Educational Service. He joined the college as Professor of Physics and electrical engineering; he had no degree in electrical engineering, but he had studied at the Central Technical Institute for about a year, and had also had practical experience with Messrs. Siemens Brothers before joining the service.

232. The annual number of admissions to the college were about 50 to the civil engineering (B.E. Civil) course, 10 to the B.E. Mechanical course, 30 or 40 to the workshop classes for sub-overseers, 6 or 8 to the Electrical Apprentices' course and 15 to the Mechanical Apprentices' course. The question of introducing an intermediate course in civil engineering, as at Roorkee, had been under consideration, and the Advisory Committee had recommended to the University that three separate courses for engineers, overseers and sub-overseers should be instituted. It was intended that the higher civil engineering course, from which the provincial engineer would be taken, should in future extend over four years, while the upper subordinate course would last only three years, the latter being simplified and made much more practical than at present. The lower subordinate course had recently been revised so as to cover three years.

233. It was difficult to say what was the average age at which students entered the higher course, which was at present common both to engineers and to upper subordinates, but it was probably about nineteen or twenty; it tended to get somewhat high as, although the minimum educational qualifications required were fairly low, a number of graduates competed who were rather older. These graduates had already finished their general education in the Arts colleges, but in making selections he insisted that they should have taken mathematics, chemistry, or physics as their subjects in the B.A. examination.

234. He was averse to any lowering of the educational qualifications required for admission with a view to obtaining men at an earlier age, considering that such a proposal was neither advisable nor practicable, although there were advantages to be gained by fixing an age limit; the men he was trying to get, and whom he found entirely satisfactory, were those who had passed the previous examination and had shown that they had a very special aptitude for mathematics and had done well in English. He generally obtained such men at about eighteen years of age, as they finished their school course at about seventeen years. He would not advocate lowering the age of admission to eighteen or eighteen and a half years, but would prefer to put it as high as twenty.

235. He could not advocate any scheme under which boys who had passed only the matriculation standard would be admitted to the college, and thus given a longer experience there, as he considered that it was advisable they should get their knowledge in the Arts colleges; this had the advantage that they learnt more or less to understand Englishmen talking English. A good many of the students who came from the high schools, where they had been taught entirely by Indians, had a bad pronunciation and found difficulty even in taking down dictation from an Englishman. It was more satisfactory to allow them to acquire their knowledge of English in the Arts college rather than to teach them English in the engineering college.

236. He did not consider that their literary education was too extensive; in fact there were many people who objected to taking a previous man at all and he himself would not be willing to accept any lower qualification. His predecessor had thought it best to take graduates as far as possible.

237. It was necessary that some limitation should be placed on admissions to the college, in order to keep down the classes to a reasonable size. There was a

very large demand for admission to the Poona College of Engineering, and as many as 300 applications for entrance had been received in one year, mostly from men who were more or less qualified for admission. There was a fair scope for the employment of engineers in normal times, but on account of the war the demand had decreased slightly.

238. He had tried to keep an account of the careers of his students. The number of government appointments for passed students was limited to four—one Apprentice Engineer and three overseers. Other students got appointments in special departments such as the Sanitary Department and in the municipalities, or in native states. There was scope in India for the employment of the students turned out from the Poona College of Engineering, but not all as engineers—many of them took up appointments as overseers.

239. The limitation of the number of admissions to the Poona College was based on the want of accommodation and the inadequacy of the staff to cope with more. It was, to a large extent, a question of funds. If the college was to be expanded and more men trained, it would be considered better to split up the courses, training some rather more and others rather less.

240. Private enterprise afforded scope for the employment of students, and the Parsee students all went into firms of that nature and into municipal service. As far as he knew they never entered government service now-a-days.

241. He considered that the courses in the Poona College of Engineering when modified as proposed would not only meet the needs of government service, but adequately meet the needs of private enterprise in India also.

242. There was no difference between the class of engineer required by government and by a private firm and although the college was designed with the primary object of turning out civil engineers suitable for government service, they were equally suitable for private employment.

243. He thought that the staff of the Poona College was adequate for what they were doing at present, but it would require augmenting somewhat when new courses were introduced. It was, in his opinion, quite satisfactory. The men to fill the higher appointments in the staff of the college were, in general, recruited through the India Office direct from England, but the last appointment was made during the war, and, as they could not get a man from England, they obtained one in India who had had a wide experience of railways. A portion of the staff of the college was recruited from the Public Works Department, and they had at present a professor who had been an Executive Engineer in the provincial service of that Department; he would revert after three or five years' service and another officer be deputed. A good many of the junior staff in the engineering branch of the college were got from the Public Works Department.

244. With regard to the suggestion that the present system did not allow for specialization in the different branches of engineering, and to complaints which had been made that the college turned out civil engineers not specialized in any particular branch, and that four years ago there had been more specialization than there was at present, he considered that it was desirable that students should be more or less all-round men when they left the college. He thought that the men turned out at the present time were better, even in special work, than those previously turned out. A great many people misunderstood the functions of the college which could at best give only a preliminary training. Students had to get their practical training outside. In the new courses, the college syllabus would be revised so as to include a substantially larger amount of workshop practice, and it was not necessary to go further than that.

245. It was rather a moot point whether practical work should be given before, after or during the college course, and one upon which he preferred to express no opinion. This question had, however, been carefully

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considered by the Advisory Committee and the general consensus of opinion was that, on the whole, and having regard to Indian conditions, the best plan was to give it after. A scheme for the combination of the practical and theoretical training of students, which entailed spending half a year in the college and half a year in the workshop, had also been considered by the Advisory Committee, but had been rejected as unsuitable for Indian conditions.

246. Both he and the members of his staff, judging from the state of the note books of students who were undergoing practical training after the completion of their college course, which note books according to government orders are periodically sent to the college for examination in order that the college authorities may be able to judge of the adequacy of the training given, were under the impression that such students were too often treated rather as visitors on the works, a position which was not calculated to give them the training they required.

247. He had seen an Apprentice Engineer going round the works taking notes in a note book when the new laboratory for the college was being built, and this had helped to confirm the impression. Some Executive Engineers certainly did take an interest in training the students and gave them something definite to do. There was no provision made by the college for the practical training of students who did not secure government appointments after the completion of their course, as far as the higher courses were concerned; but there was provision made for apprentices in the mechanical and electrical branches. The average number of students who passed out of the higher civil engineering class was 35, of whom four got government appointments.

248. It would be an excellent thing if the Public Works Department could take a number of passed students for practical training for at least one or two years after they completed their college course, and if possible similar arrangements should be made with certain private firms. It was, however, doubtful, whether many students, unless they were forced, would undertake such a course of training, even if arrangements were made by the Public Works Department. In the case of the higher mechanical branch, they had made a recommendation to the University that students should not be given their degree until they had received two years' practical training, but he was afraid that the University was unlikely to agree.

249. On three proposals which had been suggested to the Committee being put before him, viz.,

(1) that a premium should be demanded from the students for their course of practical training,

(2) that students should receive this practical training free of cost, and

(3) that students should be paid to undergo this practical training,

he was of the opinion that some sort of inducement should be given to the students. Some of the mechanical apprentices received a stipend, and the firms to which they went paid them something in addition, so that altogether they got a living wage. He would agree to the postponement of the grant of a degree until a student had had two years' practical training, and that this practical training should be considered as part of the degree course, but he doubted very much whether the University would accept such a proposal. As already stated such a proposal had been made to the University in the case of the mechanical degree, and the result was awaited. As to the suggestion that a second degree or diploma should be conferred, by some suitably constituted body of engineers, on students having had two years' practical training he doubted whether such a body existed in India, but the suggestion would commend itself to him if such a body were constituted. He had no practical suggestions to make on the point.

250. (Sir Noel Kershaw.) There was great difficulty in keeping a record of his men's careers after they had left the college. He had tried in various ways and had asked them to write after leaving college, but his efforts had not been altogether successful.

251. Very little manual work was actually done by apprentices engaged on public works; their time should,

he thought, be mainly spent on superintendence and not on doing manual work themselves.

252. Sub-overseers went to the Public Works Department, and were put on work at once although they had no previous practical experience. They drew the pay of sub-overseers and were not regarded as pupils.

253. (Mr. A. T. Mackenzie.) He thought that a better class of teachers would be secured if better salaries were given to them. Every effort was made to get the best class available for the salaries that were paid.

254. As to the grounds on which he chose the sub-ordinates who were employed as instructors, the main qualifications required of such men were that they should be graduates of the college, practical men and able to speak English fluently. For a vacancy which had just occurred, he was trying to get the Public Works Department to choose a man.

255. (Rai Bahadur Ganga Ram.) There was a combined course for the training of overseers and engineers; overseers started on a pay of Rs. 60 plus allowances. In general, the first man on the list was a graduate, but last year it had happened that the first man had only passed the previous. The minimum qualification required in the case of a sub-overseer was the school final which was equivalent to the matriculation. These men started on a pay of Rs. 30 per mensem.

256. There was a Professor of Civil Engineering in the Poona College and he was competent to lecture on special subjects such as sanitary engineering, but if there were to be further specialization in other subjects, such as municipal engineering, etc., one professor would not be able to undertake the whole work. Formerly an officer from the University was deputed to give lectures to students specializing in sanitary engineering.

257. Four men were given guaranteed appointments after leaving college, and the remainder were provided with posts in municipalities, native states, local boards and private firms. Some of the men who had left the college in the past had occasionally taken up law, but he thought this was no longer the case. He had no information as to whether any of those who were not provided with government posts became contractors, but he doubted it; they had neither the business capacity nor the capital to set up in that line. He could not say whether or not it would be possible to teach students special subjects with a view to enabling them to become skilled contractors, in the same way that men were trained for business careers in the College of Commerce in Bombay, and was unable to suggest any special means of training a student with this object in view.

258. Some of the Parsees set up firms in Bombay, and it was quite possible that of these some did contract work.

259. (Mr. Cobb.) Some of the teaching staff in the Poona College were permanent, but others were liable to occasional transfers. The relations between the students and the teaching staff were good and there had been no trouble in that connection.

260. With reference to his remark that the boys turned out from the high schools would be unable to understand English, this was a question of fact and was due to a defect in the education imparted in the high schools. In his opinion B.As. at about the age of twenty were the best material for the college training. Very few, however, could pass this examination at such an early age.

261. There would not, he considered, be enough students to allow of specialized training in four or five different subjects after two-thirds of the course had been gone through, and, in the new scheme, it was proposed to take only a dozen or so in the degree course and, if this small number were to be split up into small groups for special instruction, the expense of training each student would become excessive. Specialization should commence after graduation. Students in the Poona College specialized in two subjects, viz., civil and mechanical engineering, and there was no room for further specialization.

262. (Mr. Kent.) Under the new scheme the students of the contemplated three years' course would attend some of the same lectures during the first year as the engineering students of the four years' course, after which

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certain selected men would be picked for the latter. He could not say definitely how the details of the scheme would be managed but the overseers would be put into a separate class at this stage. At first, at any rate, they would attend certain lectures with the degree candidates as this would conduce to economy in staff. Of the four guaranteed appointments one would go to the Apprentice Engineer, and the remaining three to the overseer class. All that the men in the engineering course would thus have to look to was one guaranteed appointment. He anticipated that there would be no difficulty in providing the remaining students with appointments, as Mysore would probably take two or three, Baroda one, the Bombay Municipality one or two and so on. The Regulation allowed government a certain discretion in regard to allotting the guaranteed appointment to the first student on the list but that Regulation had never been taken advantage of. He had discussed the matter some time ago with Mr. Beale and Colonel Scudamore and they came to the conclusion that exceptions should be of very rare occurrence.

263. Even if sufficient accommodation and teaching staff could be provided for as many as 300 students (who, he had previously stated, had applied for admission to the college), there was not sufficient demand in the Bombay Presidency for so large a number. Had there been such a demand, he would certainly have received more applications from employers, and more advertisements calling for engineers would have appeared in the papers. The result of such an extension would probably merely be to launch a large number of discontented men upon the country.

264. In selecting students for admission to the college, he was guided mostly by academic qualifications. Ques-

tions were asked as to their theoretical qualifications, and if the replies were considered satisfactory, the men were called for an interview. He laid great stress on the necessity for a personal interview, which he considered to be most important.

265. With regard to the suggestion that it might be possible to create contractors by giving them a course of training at Poona College, he was of the opinion that such a course was not feasible, and was not worth consideration.

266. Adverting to the student who used to go round taking notes when the new laboratory at the Poona College was being built, he stated that it would have been better had this man been employed, for instance, as the head clerk for a month or as an overseer for a month. He would, however, have been unwilling to put a man with no practical experience whatever in a position of responsibility on such an important work as the new laboratory building.

267. (President.) The suggestion that the time spent in studying heat, light, sound, etc., might be devoted to applied mechanics, materials and details of construction would require very careful consideration. He was personally of the opinion that the former subjects could not be cut down.

268. There was no course of book-keeping and accounts in the civil engineer's class. There was such a course in the sub-overseer's class, and he did not think there was any necessity to introduce it for the engineers.

269. (Mr. Mackenzie.) The fee for the engineer's class was Rs. 60 per term for students who passed their qualifying examination in the Bombay University and Rs. 75 per term for those who qualified at any other University except Bombay, for 2 terms a year.

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Written Statement.

270. (VII) Education and (VIII) Practical training.—As I have had little or no connection with the work of the Public Works Department, I confine myself to these two points.

(2). To quote the opinion of many persons whom I interviewed with Lt.-Col. Atkinson in the inquiry of 1912, it would appear that the system of training for engineers in the engineering colleges was generally suitable, and produced a class of man who ultimately carried out his work successfully, but that much of the advantage of this education was negated by the fact that men left their college with very little practical training, with no idea of a business-like organization of labour and materials, and with no experience of the control of workmen.

(3). Practical training is most essential, and in this country absolutely necessary, as from a fairly long educational experience I find it is not sufficient to say how work is to be done, but actually to show practically proper methods of executing such work, and, therefore, practical training should occupy a greater period of time than is at present allowed for in a college course, which should be supplemented with at least one year of outside experience under some responsible engineer, and opportunities should be given to students actually to take part in practical work and be taught how to handle men and materials economically.

(4). The age at which a student begins his actual engineering education is a great handicap against him, and it is hardly fair to expect a man to pass his intermediate examination and then take a four years' engineering course, supplemented by a year's outside training, and then at twenty-five or twenty-six years' age to offer him a salary of Rs. 50 per month, or about what is paid to an uneducated carpenter or mason who is working under him. Unless some considerable change is effected in this direction I doubt whether suitable candidates will be attracted in sufficient numbers to meet the increased demand for men which any change in the Public Works Department establishment might make, or private enterprise demand.

(5). As a remedy I would suggest that the entrance standard of the engineering colleges should be lowered and students induced to enter at an earlier age, that some of the subjects at present included in the curriculum be excluded, and more practical work carried out, and that in giving out contracts for government work it should be insisted on that the contractor or engineer should agree to take a certain number of students who had completed their college course, give them administration and control of sections of work according to their ability, and pay them a wage of at least Rs. 45 per month during the period they are under training.

(6). By reducing the age and standard of entry I believe you would get a student keener on his work, adaptable to change in educational matters, and more easily trained in method and discipline than an older student whose ideas are somewhat controlled by the literary atmosphere of his longer period of education. In other words, take your material young and you can make something of it, at least that is my experience in the Victoria Jubilee Technical Institute.

(7). With regard to the courses laid down for the degree in civil engineering, it should be clearly understood that I do not deprecate the value of science, but where the time available is so short it appears to me that the amount spent in heat, sound, light-energy, heat-energy, sound-energy, prime-movers theoretical and practical, (purely a mechanical engineering subject) might well be devoted to applied mechanics, materials and details of construction, and a sounder training in practical mathematics.

(8). A great amount of improvement in the character of work done might be made by extending the classes for training building *mistris* on the lines of what has been started at the Technical School in Dhulia, under the control of the Committee of Direction for Technical Education. In this class, selected students who have had a three years' training in carpentry are put through a further course, where they are taught very simple mensuration and estimation of quantities and general building construction; only a few of these men have yet been turned out but the reports received of their work are satisfactory and amply justify a trial of the scheme in other places.

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[Continued.]

MR. T. S. DAWSON called and examined.

271. (*President.*) The witness stated that he was the Principal of the Victoria Jubilee Technical Institute, and had held that appointment for about eleven years. He was also a member of the Committee for Technical Instruction, for the Department of Education, in the Bombay Presidency, and a member of the Advisory Board for the College of Engineering at Poona.

272. His own institute was not a training college, and did not give men collegiate courses at all; it was a purely technological institution. The staff was not an examining body, except in so far that the board of the institute appointed their own examiners. The institute had a mechanical engineering section, an electrical engineering section, a plumbing section and a sanitary engineering section. As regards the sanitary engineering section, the title must be interpreted in its limited sense, as the course dealt rather with the repair and maintenance of sanitary appliances than with sanitary engineering as understood by a civil engineer; instruction was however given in a separate course in piping arrangements and small septic tanks, etc. There was a chemistry section which dealt with both organic and inorganic chemistry. After instruction in these sections a student had to determine which of the courses in applied chemistry he would take up, *e.g.*, fuels, soap manufacture, dyeing, bleaching, etc. There was a textile section which embraced spinning, weaving, and complementary subjects, and in which there was a hand-loom weaving class for the sons of weavers. The instruction given in the institute was therefore fairly extensive, but the only branches which could be held to fall within the scope of what is usually understood by civil engineering were the sanitary engineering and plumbing sections.

273. The institute was supported by government. It received a grant from government, who had a controlling voice in its management and nominated the greater number of representatives on the board. The institute was under the control of this board, which contained also representatives of the Bombay Municipality, the Mill-Owners' Association, and the Trustees of the Ripon Fund.

274. As to whether the class of training given in the special branches of this institution, the mechanical engineering branch, for example, was intended to turn out a mechanical engineer or only a subordinate of that profession, the witness stated that he used the term "mechanical engineer" as denoting a man who had gone through the mill from the bottom. Such a man might be a mechanical engineer from the start, and yet hold no responsible position for many years. He was inclined to think that the instruction given in the institute was equivalent to that given in European institutions of a similar nature, and the institute had, on more than one occasion, succeeded in getting medals from the City of Guilds, London.

275. The educational qualifications for admission to the institute were the school final, or study up to the matriculation standard, but it was not necessary that a student should have passed the matriculation. The institute generally got twice as many applications for admission as there were vacancies. The minimum age limit was sixteen and no one below that age was admitted, but older boys of seventeen and eighteen years were taken in. The average age at present on joining was about seventeen.

276. The length of the course at the institute was four years, but in the final year six months of practical training was arranged for outside the institution in some recognised establishment, where the students could see work carried out under the charge of a responsible officer, and learn to realize the commercial value of work. This period of practical training was a necessary qualification for the diploma of the institute. The difficulty of getting the men to do a prescribed amount of practical work had previously been so acute that some four years ago a rule was introduced by which no student was allowed to go up for the annual examination unless he had, during the year, obtained at least 75 per cent. of the marks

allotted for practical work, both in the institute and outside. This was now insisted on and the students course might hence be said to be of the nature of a perpetual examination.

277. He did not agree with the views expressed that the Poona Engineering College was unable to take in students at the age the Victoria Jubilee Technical Institute took them, because the educational standard of students of this age was insufficient. He considered that the lecture work of the institute was probably quite as advanced as any done at the Poona Engineering College, but the institute gave the students a good deal of general educational instruction which was not undertaken at Poona. It was true that when students came to the institute their knowledge of applied mathematics was exceedingly poor, but since they had started a course in this subject they were finding no difficulty in taking men of the age referred to.

278. As to whether any difficulty was encountered on account of deficient knowledge of English on the part of the students, the witness stated that the boys who came from Mysore and Madras had generally sufficient knowledge for the purposes of the institute, but that those coming from the Bombay Presidency were not always so good. No instruction in English was, however, given at the institute as it had not been found to be necessary.

279. He was unable to say off-hand whether it would be possible to insist upon a year's practical training in a workshop for all students either before admission to an engineering college, or after they passed out of such a college; it would depend to some extent upon what opportunities could be given to these men and whether the authorities would undertake to provide such opportunities, or left it to the students themselves to acquire the experience.

280. Asked which of the three following alternatives he thought would be best;

(1) that a certain amount of practical training should be given before entering college;

(2) that the practical training should be given during the college course; or

(3) that practical training should be given after completion of the college course;

he stated that his opinion was that the practical training should come after the college course, for the reason that most civil engineering work consisted of surveying, levelling, estimation of weights and quantities, and superintendence of works, the object being to see that both the quality and quantity of the work were as they should be.

281. A scheme had been instituted for the purpose of giving a practical apprenticeship of two years' duration, with firms in Bombay, to students from the institute but had failed because, out of all the firms which had originally agreed to take these students, only four were prepared to fulfil their promise when the time came.

282. With regard to the six months practical training which his students took in their final year, the institute had personal influence with the staff of the firms which undertook the training, and hence experienced no difficulty in placing the students. The men did their six months' outside practice in the first half of their final year, and took up a more advanced course in the last six months, after which they sat for their final examination. In regard to practical training after the completion of the course, he suggested that the engineer, or officer in charge of the practical training of a student, should pay the latter a sum of at least Ra. 45 a month. In his opinion apprenticeship without payment was worthless, the student himself taking no interest in his work because he was receiving no payment, and the firm being apt to think that it was not their business to look after him and see that he was doing the work given him, because they were paying him no wages. If a wage of Ra. 40 to Ra. 45 were given to the student, he thought that the engineer, or officer in charge, would see that the student earned this wage, and did as much work as he possibly could. He admitted that the English practice was rather an

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favour of the payment of premia by the students for the practical instruction they received, and stated that this had been so in his own particular case. But for Indian conditions he was of opinion that the students should, undoubtedly, be given a living wage, without which neither they nor their employers would take any interest in the instruction given. He further suggested that those contractors who were given government contracts by the Public Works Department should be bound to take a certain number of pupils for practical training. He admitted that what he advocated was contrary to the whole theory of contracts, which was to secure the best man for the work, but considered that unless something of this sort was done it would not be possible to give the students the necessary practical training. His suggestion that the Public Works Department should be required to take in hand not only students who would ultimately secure appointments in that Department but also others as well was made under the impression that a reorganization of the Public Works Department was likely to take place. A training under the Public Works Department would probably be better than the training under a contractor.

283. The Trades' School at Dhulia was one of the best up-country schools of its kind in the presidency. It was not a technical institution, though it might, perhaps, be called a technical school, and no science course had to be gone through by the students. It was purely a trades school which gave instructions in carpentry, etc., after which most of the men, who had done their three years' course in this subject and satisfied the examiners, entered a final course and were given an opportunity of taking a two years' course during which they studied building construction as applicable to very simple designs, and elementary estimation of weights, quantities, etc. The school did not turn out men of the sub-overseer class, but men of a type which might be compared with jobbing builders. This scheme has been in operation at Dhulia for about five years. Last year all who passed out of this school succeeded in getting appointments. They generally started on Rs. 20 to 25 a month. Two such men were in business at Dhulia doing building work and as far as reports showed the scheme was quite successful. The Committee of Direction for Technical Education had submitted a proposal for the establishment of schools on similar lines in other places in the presidency. The general education of the men who joined the Dhulia school was about up to the sixth standard in the vernacular. The best men reached that standard but did not go beyond it. The students of this school were drawn in nearly every instance from the hereditary castes of carpenters, smiths, etc., and the school had hence got hold of the right type of men, but one man he remembered had, prior to joining the school, been some sort of minor official on a railway. No fees were charged for instruction in the Trades' School at Dhulia, and scholarships were not given. Asked whether the men were fed as well as educated free at this school, he stated that only the education was free, though the men were allowed, if they were good enough, to take up small contracts for such furniture as desks, tables, etc. The materials were brought into the school and the men were allowed to make them up under supervision, and realize what they could. Some of them, after completing their day's school work, went out and worked with contractors, as only six hours school-work a day was insisted on. He added that this type of institution could be developed with advantage to the country, and that his committee, of which Sir Frederick Sprott was a member, concurred in this opinion. The *mistris* at the Dhulia school were taught a certain amount of blacksmith's work so that they could make small bolts, clamps, staples, and in fact anything that they might require for a small contract.

284. (*Mr. Cobb.*) Witness stated that there were many schools in the presidency where training in hand-loom weaving, carpentry and smith's work was given, but he did not think there were any schools which gave instruction in boot-making. He added that, at Parel, instruction was given in sign-painting and book-binding. He did not know of any school for printing work in the Bom-

bay Presidency, but the Church Mission at Ahmednagar had a printing works. He did not think that this works was a school of the nature referred to.

285. The curriculum followed in his institute occupied the whole day. Instruction started at present at 10.30 A.M., and lasted till 4.30 P.M. As soon as the new building for the institute at Matunga was completed it was proposed to start work at 8 A.M. and finish at 5 P.M. except on Saturdays. The students now gave their whole time to the institution: the electrical engineering men, for example, had to run the power station, and certain squads were told off—three mechanical and two electrical—to go in the morning to see the coal weighed and maintain records of the day's work. This system had been found successful. Some years ago the institute started an evening class for machine-drawing, and lectures on applied mechanics, steam and steam engines, but although it started with 150 students the number dropped to something like 10 after six or seven months' work. This he attributed to the long hours the men had to put in before the classes, and he did not think it possible to run evening schools unless students were left free during the day. A man could not start at six in the morning and work till six in the evening with only one hour's rest during the day, and then take up other work afterwards. He did not think there was much hope of establishing evening classes, except perhaps on railways. There was a school for apprentices belonging to the Great Indian Peninsula Railway, but although these men were let off in the morning from ten to twelve o'clock, and were paid their time for going to the school, it was not a success.

286. (*Rai Bahadur Ganga Ram.*) Asked whether the institute could supplement the instruction given at the Poona College of Engineering, by giving students a course of practical training in certain special subjects, the witness stated that the only subjects in which such training could be given were sanitary and electrical engineering. He thought that it would be feasible to give the men who passed out of the Poona College, as sanitary engineers, one or two years' apprenticeship at the Victoria Jubilee Technical Institute, during which they would receive a practical training in sanitary engineering, and that his board would agree to such a proposal. He could not, however, agree to take up any other class of engineering except sanitary work for the purpose of supplementing the Poona College courses.

287. He was in favour of the suggestion that, as men at present entered the Poona College at too late an age, the educational qualification required for admission should be reduced to the matriculation.

288. With regard to the suggestion that a boy of 15 or 16 should have a two years' training at the Victoria Jubilee Technical Institute, and then go to the Poona College, this would be of no use whatsoever, because there was nothing parallel in the two systems of instruction, nor would any practical object be effected if some of the better students of his institute, who understood English better than the majority, were selected after having been trained at the Victoria Jubilee Technical Institute up to about the age of twenty or twenty-one, and given the privilege of entering the Poona College. Better engineers than the class now turned out by the Poona College would not, he considered, be obtained by this means, as the courses in the institute, in sanitary and mechanical engineering for instance, followed by a civil engineering course at Poona, would produce a hybrid who would be neither artisan nor engineer.

289. (*Mr. Kent.*) The course at his institute extended over four years. If, however, a man had received his education in civil engineering at the Poona College, and it was considered desirable for him to receive practical training in some special branch of civil engineering work, e.g., sanitary engineering, it would be possible for him to spend only two years at the Victoria Jubilee Technical Institute instead of having to go through the whole four years' course, by receiving his instruction in that class of the institute which allowed of specialization in a technological subject for a period of two years. The four years' course at the institute included a number of subjects which the student would probably have already studied

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at Poona, such as physics, chemistry and mechanics, all of which formed part of the course in sanitary engineering given at the institute, and such a man could, therefore, apply his whole time to the practical study of the subject he took up. There were four examinations in plumbing, for instance, in the institute; these were progressive examinations and the student who came from Poona should be able to take the first and second year's examinations in one year, as he would be able to devote double the time to his special subject. The student ought also to be able to take the third and fourth year's examinations in one year for the same reason.

290. Students of the institute received instruction in physics, mathematics and chemistry in the first year, physics and chemistry in the second year, chemistry and hygiene in the third year and hygiene in the fourth year. Hygiene would, therefore, be the only subject left for a student to take up in the second year, and the rest of his time could be devoted to the practical work of plumbing, etc. Under these conditions the student should therefore get through the four years' course in two years without difficulty.

291. The length of the course at the school at Dhulia was three years, to which another two years were added for the *mistri* class. The whole time of these men, was not, however, occupied by the school. Last year they were allowed three days in the week for work outside. Of the men in that school 95 per cent. came from the hereditary carpenters' and smiths' castes. The three men he had examined last year had had letters offering them work in the Public Works Department when they had passed their course, but he did not think that masons passing out of the Dhulia school would be competent enough to do mason's work in the Public Works Department immediately after leaving school.

C. C. SWETENHAM, Esq., Deputy Accountant-General, Bombay.

Written statement relating to the Public Works Department accounts system.

N. B.—The opinions expressed in this memorandum are purely personal and are in no way those of the Accounts Department.

294. The Public Works Department is divided into three main sections:—

- Railways,
- Irrigation,
- Buildings and Roads.

For the purpose of this note, railways are disregarded. The Irrigation and Buildings and Road Branches deal with the construction and maintenance of canals, tanks and other irrigation projects, and of roads and buildings. They include such undertakings as electrical installations and the running of workshops and store-depôts, also water-supply and sanitation. Details differ in the various provinces. In some, for instance, the Public Works Department collect irrigation revenue, in others, this is done by the civil officers. In some provinces local and district boards carry out a certain amount of work on buildings and roads in their own jurisdiction.

295. All important work is usually executed under the supervision and control of Public Works Department officers, but sometimes by civil officers in special cases. The execution is effected either by contract, by the Department itself with its own labour and materials, and sometimes by a mixture of both methods.

296. Of late years, the tendency has been for less and less work to be done *departmentally*, and more to be done by contract. In fact, the Department may be said to have now passed from the era of departmental execution to that of *contract*. The results have been:—

- (a) a reduction of the *book cost* of establishment and supervision;
- (b) reduction of the subordinate and superior staffs with technical training;
- (c) loss of experience in the method of organizing local labour and resources;
- (d) gradual subservience to contractors, to rings, and liability to the cost of work increasing all round.

292. (*President*.) The municipality gave the Dhulia school a grant, and the Department of Education also contributed a grant-in-aid, this grant-in-aid being equal to half the salary of the teaching staff and half the amount spent on furniture, etc. Government thus supported the school to a considerable extent. The government grant was earned upon conditions which were irrespective of the amount of work or the number of students turned out by the school. It was paid under two heads, the total amount being equal to half the salaries of the teachers for the year, and half the amount spent on furniture, etc. The first grant was divided into three sections, one for the percentage of successes at the annual examination, another for attendance throughout the year, and a third for general development, i.e., increase in the number of students. The first of these sections was sub-divided into three classes. If a teacher obtained 75 per cent. of successes at the examination he got the full grant, if he obtained 50 per cent. he got half the grant, and if he obtained 33 per cent. he got a third of the grant. The witness had advocated this scheme with a view to getting the teaching staff to put their backs into their work, as now, if a teacher did not earn his grant, another man was put in his place.

293. He was of opinion that it would be useless to introduce a special course for men who were desirous of taking up contracting work since business and commercial methods could not be taught in an educational establishment. These methods could only be learnt in an atmosphere of work such as contractors had to deal with. Successful contractors in England were often men who had started as jobbing brick-layers. He remarked that in one well known firm of contractors all three partners had worked as dockmen in their early days.

The tendency to reliance upon contractors has doubtless in some provinces and cases led to the money spent in a district going into the pockets of contractors not belonging to it, i.e., going out of the district. This present system has, I think, arisen to some extent from the constant endeavour to cut down the cost of establishment especially in the skilled grades, which is shown distinct and apart from the actual cost of works and not as portion of the cost of the works themselves. We have thus closed an avenue to freer employment of the educated in India. Such educated labour has not on its part been taken up and employed by the contractors whom we have substituted for our former departmental agency. The general benefit to the community is doubtful.

297. The accounts may be divided into groups:—

- (i) The *initial* dealing with the individual original transactions;
- (ii) The *consolidated* grouping the individual transactions by works and main account heads monthly, and comparing actual expenditure with grants and sanctions.
- (iii) The *abstracts*, bringing out the net expenditure and revenue monthly and annually on the finance heads concerned for comparison with the budget estimates and grants by the higher authorities, i.e., the local Governments and the Government of India.

2. The earlier stages of the Public Works Department accounts proceed on two different lines, which are finally tallied and check one another:—

- (a) accounts of individual works;
- (b) account of cash, stores and book adjustments.

In addition to these we have the expenditure on establishment and tools and plant, which is not treated as portion of the cost proper of individual work in the departmental sense.

298. The principle underlying the more advanced methods adopted by Public Works audit officers towards the offices accounting to them, was that *no account should be exacted from the executive officers which could more properly or more readily be prepared by the audit office itself*. Exceptions occurred when, on a general "return" being demanded by government, it was found that the

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time and amount of work involved would cause least embarrassment to the ordinary staffs if the work were distributed over several offices instead of allotted to one.

2. There appears to be always a natural tendency, in the absence of close supervision, for audit or indeed any office to relieve itself of work if it can induce any one else to undertake it. This leads to friction and protest and consequently has to be carefully guarded against.

3. It is evident that the audit office must be supplied with facts, as accounts are supposed to be records of facts and not fictions. These facts in their turn must be limited to what is *essential* for the audit officer's purpose. There must be also a *guarantee* that the facts supplied to audit are *full*, i.e., sufficient for the purpose required, and *correct*. Consequently, the accounting office must prepare, examine and sign various documents, which otherwise might be waste paper or mere fiction. As there is no one else in a Public Works division competent to give such guarantee, the Executive Engineer has perforce a considerable amount of office account work to perform in addition to his executive work proper. It has always to be borne in mind however that his prime duty is the proper execution of work and that the accounts, being but a record of his operations, cannot take first place in his duties.

4. In the exercise of his account duties, the Executive Engineer is on a different footing *in respect of assistance* to officers like the Collectors of districts, who are furnished with a treasury officer who largely relieves them of the routine duties in connection with the district initial accounts and returns to audit.

5. The Executive Engineer in addition to the ordinary account for establishment and contingent expenses that other civil officers chiefly deal with, has the accounts of his works and operations. In this he is unlike all other officers except the Forest Department. On the civil side, special accounts and procedure are adopted for the forest operations.

299. The accounts officer has now a large number of functions. They relate to :—

- (a) Account.
- (b) Audit.
- (c) His position as agent or watch dog for the controlling authorities.
- (d) His position as financial adviser to the local authorities including help in budgetting.
- (e) Statistics.
- (f) Currency and Reserves.
- (g) Purchase of bullion.
- (h) Government loan issues.
- (i) Trusteeships.
- (j) Control and management of the establishments, sometimes large, under his orders.

N. B.—(f) (g) (h) (i) are duties belonging purely to the civil accounts side.

300. His chief difficulties arise from work connected with :—

- (a) Audit.
- (b) His position as agent for the controlling authorities.
- (c) His position as financial adviser.

In the exercise of these duties he is sometimes rigorously limited in his discretion. When he has discretion, he has to hold the balance between the Imperial Governments and the local authorities he has to deal with.

2. He is now immediately under the orders and subject to the advice of the Comptroller-General who himself has at last been made independent of the execution and administration so far as his promotion and decision are concerned.

301. It will be seen from the above brief resumé of an accounts officer's functions that there will probably arise many occasions for divergence of opinion and friction when rules and orders have not been too clearly formulated, or when the raving for uniformity has permitted him little discretion and latitude in dealing with particular local circumstances.

302. The principal causes of friction are as observed above :—

- (a) Want of clearness in rulings by the higher authorities,

(b) Want of elasticity in rulings.

(c) Desire for uniformity in detail as well as principle.

(d) Restriction of discretion.

303. As regards uniformity, the idea has probably been to prevent the tendency to go as you please. It has its limited advantages.

2. The latter-day tendency is to permit latitude in detail, while insisting on uniformity in principle. This can of course like any other non-rigid rule, be taken advantage of. But the gains must be balanced against possible losses.

3. As regards *restriction* of discretion, this was probably intended in the cases concerned to strengthen weak-backed audit officers in transactions with more powerful personalities, especially when, as used to be case, the prospects of audit offices might be seriously influenced by the report of the very officers they were supposed to hold in check.

304. It is with some reluctance, on personal grounds, that I now deal, as requested, with the amalgamation of the public works and civil accounts.

2. My original attitude in 1909-10 towards this amalgamation was that it was an ideal scheme, but that its practicability was doubtful owing to the amount of work to be dealt with in an amalgamated office, the work in the existing offices being already in many cases excessive.

3. The *ostensible* objects of the amalgamation were greater efficiency and economy. It was hoped to secure this by :—

(a) Local centralization of control under one accounts office.

(b) Saving of work in accounting Public Works Department offices and audit office.

(c) Speeding-up of the submission of accounts.

(d) Economy by combining work in the amalgamated offices.

(f) Greater efficiency of audit.

4. I may as well point out to start with that the fusion or so called amalgamation of work and staffs commenced in September 1910. It is now January 1917, and the operation has not yet been completed in a period exceeding six years. This mere fact appears to carry with it the condemnation of the amalgamation. The natural inferences are either mismanagement or impracticability.

5. I am personally of opinion that whether practical or not the whole matter has been mismanaged by those who started it.

305. The proposed fusion started on the assumption by the civil authorities that :—

(a) There are always questions cropping up in the public works accounts, and friction. Therefore that system is bad.

(b) We have less trouble with the civil accounts. Therefore, that system is better.

(c) The public works must accordingly be incorporated with the civil accounts.

2. The difference of the operations of the two departments, the difference of the status, powers and discretion of the two sets of accounts officers, the difference in dealing with personal governments like those of the United Provinces and the Punjab and council governments like those of Bombay and Madras have to be taken into account in considering (a) and (b). It was in the non-regulation and personal government provinces that friction usually occurred, owing largely to the want of knowledge of the Public Works Department methods and system (established by India) on the part of the higher locally trained authorities. It was apparently considered impossible to make the alteration necessary in the Public Works Accounts Department itself.

306. The public works accounts offices, when the amalgamation was proposed, could not claim that their system was yet perfect. Nor could they, being unacquainted with the civil account system, deny that that system was better. The civil authorities, therefore, who knew little about the Public Works Department account system and probably but little more about the civil, carried the day, holding out the two hopes of economy and speeding-up to be accomplished doubtless by a certain amount of "spade work," which however would

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be relieved by sympathetic consideration in reducing work, better prospects for the staff, etc., etc. The work to be done consisted :—

(a) In abolishing work rendered superfluous by the amalgamation.

(b) In simplifying or standardizing work and accounts.

(c) Amalgamation of the two staffs, both of superior officers and men.

307. As regards results to date, it may be briefly stated that as regards executive offices :—

(a) No real reduction of work in Executive Engineers' offices has taken place. Some alteration of names and forms has taken place.

(b) Their power of ready-account, review and control over their operations has been reduced, *vide* the abolition of the schedules of expenditure of works, and the splitting up of the establishment bills.

(c) The check over accounts in the Executive Engineers' offices tends to be impaired.

(d) The so-called "speeding-up" is not an "economic" speeding up.

(e) There has been a demand for more establishment on account of extra work alleged to be entailed.

308. As regards the effect on the Accountant-General's office :—

(a) So far no tangible economies have become apparent or simplifications.

(b) No alterations have been effected that *could not equally well have taken place without amalgamation*.

(c) The "speeding-up" is of more nominal than practical value.

(d) The "speeding-up" has impaired "works" audit and tended to render it perfunctory and trivial. I find a large number of remarks now in audit notes regarding the fees leviable from dak-bungalow visitors.

(e) The so-called "speeding-up" has led to a rush of work at certain periods instead of a more even distribution.

309. On the whole, I may briefly state it to be my opinion that :—

(a) No appreciable economy has been effected either in accounts or executive offices.

(b) The efficiency has been impaired in the local and audit account offices.

(c) The local centralization under one accounts officer involves too great a quantity and variety of work for that officer, who after all is but human, to deal with adequately.

(d) The standard of efficiency in civil accounts offices and the training of their staff, both superior and subordinate, is inferior to that of the late Public Works Accounts Department.

310. The disposal of work in India and elsewhere must depend upon the terms upon which the staff to deal with it can be engaged and supplemented, *i.e.*, the flexibility of the staff and the variability of the work it has to cope with.

2. In India practically all office employment is upon a *monthly* basis. The result is that ordinarily work is so arranged that a month's work is disposed of finally in a month, that being practically the "economic" speed. If we require a month's work to be disposed of in ten days, we require to entertain three times the staff that can dispose of it in thirty days, and, therefore, squander the excess staff for the remaining twenty days. Such extra-

vagance is only justifiable in extreme cases. In ordinary cases, we may take it as an axiom that the economic scale of establishment for India is that which is capable of doing a month's work in a month, neither more nor less.

311. The ideal dangled before our eyes of "speeding-up" the accounts for the Government of India contained two fallacies :—

(a) First, that such "speeding-up" was essential.

(b) Secondly, that the civil accounts were finally booked and audited long before the public works accounts.

2. As regards (a), the Government of India used to be provided with approximate figures of past and future expenditure under the Public Works Department system three days later than they are provided with the civil accounts now, *i.e.*, on the 17th of each month. The approximate were rarely materially different from the finally audited figures and could be utilized in all but infrequent and unlikely emergencies, when special steps could be taken to ensure actuals.

(b) In point of fact, although the civil accounts were booked in the audit office earlier than the public works accounts, their actual *final audit* was not complete for some time after the *final audit* by the Public Works Department, the delay sometimes stretching into months.

312. As regards the amalgamation of establishments, this has apparently been hindered by the difficulties of reconciling the interests of the various establishments and their vested interests. Possibly the solution will be simplified by the dying-out or retirement of the existing members.

313. The real factors of efficient economic organization and disposal of work are —

(a) Specialization of function.

(b) Standardization of work and results.

(c) Co-ordination of work inside the office and outside.

These imply limitation to the scope of work, if the highest efficiency is to be obtained. Judged by these, the so-called amalgamation is a retrogressive movement. There can be no absolute uniformity of accounts and methods in dealing with different sets of circumstances. Nor does such uniformity exist even on the civil accounts side.

314. The accounts establishment should be limited in extent and scope to what can properly be controlled by their superior staff and the main operations with which they have to deal. They should be fully manned. Their officers must be of acknowledged status and have direct access to the government to which attached. They must be independent and under the direct and sole orders of the Comptroller-General and the Government of India. Their discretion must, subject to reference to the Comptroller-General, be unlimited, except in matters of main principles. We should then have but little friction with local Governments, and the Government of India would not be wearied with unnecessary matters of detail.

315. Even before the amalgamation, some public works accounts offices were undermanned both in subordinate and superior staff. This is bad economy, as their work must necessarily increase with the gradual development of the country's resources. It is a question whether a much greater increase of the superior staff would not repay government. After all, it is a matter of insurance.

MR. C. C. SWETENHAM called and examined.

316. (*President*.) The witness stated that he was a member of the Finance Department and had had 29 years' service, of which the first part had been wholly spent in the Public Works Accounts Department, which had, for the last six years, been amalgamated with the general Finance Department.

317. He explained the statement made in his written evidence, where he had mentioned that certain changes had been made by the Public Works Department with the object of cutting down establishment and showing a better return, by saying that the cost of establishment was generally gauged by the percentage that it bore to

the expenditure on works and repairs carried out by that establishment, and that if, for instance, in some provinces the cost worked up to 25 per cent. and in others to 33 per cent., the administrative authority naturally wanted to know why the 33 per cent. could not be cut down to 25 per cent. In considering the possibility of such a reduction the Public Works Department had, however, to take into account a large number of local circumstances. The percentage figure depended to a certain extent on what classes of establishment were included in the cost of works, the practice in which respect differed in the various provinces, and also, largely, on the amount

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of work that was carried out for local boards, or as contribution works, either without any charge for establishment at all or at a reduced cost, in regard to which the local Governments concerned exercised discretion.

318. The reason why the actual expenditure on Public Works Department establishment did not show a reduction but rather an increase during late years was, he considered, due probably to increases in the pay of the staff, and to expansion of the work of the Department. His personal impression was, however, that the percentage cost had been largely decreased. At the same time he was not sure that this percentage cost of establishment was a sound criterion upon which to base deductions, as the tendency had been for less and less work to be done departmentally and more to be done by contract, and since naturally the contract price included the cost of certain establishment that would otherwise have been borne by the Department, the cost of the departmental establishment was really reduced only by transfer of the expenditure to the head of cost of works executed under contract. He was of opinion that the substitution of contract for departmental work, while causing a decrease in the cost of the Indian establishment employed by the Public Works Department, did not increase the cost of the Indian establishment employed by contractors to any material extent, because contractors employed only *mistris* and trusted to the Executive Engineer, on whose shoulders fell the burden of keeping these *mistris* in check, to supervise the work. By this means, however, the work was put through with a smaller amount of Indian establishment in government employ.

319. The present scarcity of men for the filling of posts in the Public Works Department, and the inability of that Department to relieve more officers for war service constituted, he thought, an argument against any further reduction of the present Public Works establishment. The more establishment there was, the larger would be the number of posts available for educated men, and the more scope there would be for reduction in the case of emergencies like the present war.

320. Contract was not, in his opinion, an economical method for the execution of works. In India it tended to raise rates. The gradual rise in rates all over India was partly due to the natural rise in prices which had taken place, but also to the tendency, when works were given out on contract, for the contract rates to go up at once to the full estimated rates. This tendency of rates to rise higher and higher was very marked, and although an officer might get tenders for a certain work 5 or 10 per cent. below standard rates, he usually found himself sooner or later in the hands of a ring of contractors. Standard rates were, as a rule, worked out upon past actuals, that is, they were practically framed upon the contract prices, and not upon real cost of execution ascertained by departmental execution. They consequently tended to move in an exceedingly vicious circle. A sufficient proportion of departmental work was the only corrective.

321. With reference to the statement in his written evidence that accounts were divided in the audit office into three stages—the initial, the consolidated and the abstract, he explained that the possibility of transferring the preparation of the consolidated accounts from the Executive Engineer's office to a central office, and of allowing the Executive Engineer to be responsible only for his initial accounts, i.e., his records of payments and his vouchers, which were all that he required for his own purposes, depended upon where the limit between initial and consolidated accounts was drawn. By initial accounts he understood that the Executive Engineer's individual transactions, i.e., each item of payment and receipt, were meant. As, however, an Executive Engineer's control and scrutiny was by works, it was, he considered, necessary to have these individual items of payment grouped under their respective works in order to let that officer know how his works expenditure was progressing. To take away this grouping of transactions by individual works from the Executive Engineer would, he thought, be inadvisable, although

that procedure was followed, to a certain extent, on railways.

322. An Executive Engineer was supplied with a staff to which was entrusted his initial and elementary accounts work. The Executive Engineer, besides supervising the construction of works, was also a disbursing officer and, as far as audit was concerned, he was the officer who guaranteed the accuracy of the facts supplied to audit, and audit accepted no lower authority as a guarantee for the facts put before it. He did not agree with the contention, submitted in evidence by certain Executive Engineers, that the compilation of their monthly accounts was detrimental to their executive duties and constituted an unduly large proportion of their work, engaging the whole of their staff for several days, and taking up a considerable amount of time besides necessitating some hundreds of signatures on the monthly account forms and statements. The question of signing so large a number of certificates, statements and forms had, however, always been a debatable one. He was not personally in favour of this system and did not believe in meaningless signatures. He believed, however, in insisting on proper scrutiny, and in enforcing that scrutiny to a reasonable and practicable extent. He admitted that there was undoubtedly a tendency on the part of audit to insist on signatures here, there and everywhere, in order to relieve its apprehensions and he thought that these apprehensions were, in the case of the ordinary Executive Engineer, unnecessary.

323. The tenth of each month was too early a date, he thought, to be fixed for the submission of an Executive Engineer's monthly accounts, as it did not allow for their proper or adequate preparation and shortened the time at that officer's disposal for check, comparison and scrutiny of such items as he might reasonably desire to see, hampered his movements, and gave him very much less latitude for his executive duties. He considered that, if a later date were fixed for the submission of the accounts, the Executive Engineer would have more opportunity for attending to his executive duties.

324. He believed that there was an order in Bombay prohibiting payments during the last days of the month, but was not able to make a definite statement on the point without a reference to the rules. If, however, it was the case, he thought it was a recent innovation.

325. The large percentage of 48 per cent. of the whole of last year's public works expenditure in Bombay which was placed under objection by the Accounts Department, was based on the value of the transactions objected to as compared to the total expenditure. He knew of numbers of cases of works done in anticipation of sanction, works done without estimates, or without sufficient estimates, and these formed a very large percentage of the objections, which were based on the value of the transactions and not on their number. For instance, if objection were taken to expenditure on a work costing Rs. 50,000, sanction to the estimate for which had not been obtained, instead of this being recorded as a single objection, the value of the whole transaction would be added to the total amount held under objection and thus swell the so-called percentage. The witness did not therefore think that this large percentage of objections was a fair criterion upon which to base any opinion.

326. With respect to the criticisms made against the Audit Department for objecting in regard to certain matters in which the Public Works Department was the best judge such as the rates paid for particular classes of work, the witness stated that in the old days, before the Public Works Department committees of 1887 and 1888, one of the functions enjoined on the audit officer was that of scrutinizing rates. After the reports of these committees had been received it was decided that the question of rates was primarily one for the controlling officer and that the function of audit should be confined merely to pointing out any marked abnormality in rates, or the payment of rates in excess of sanctions. He thought that the action of audit, so long as it was confined to this, was legitimate, and added that, so far as he knew, it was so confined. If an audit officer went beyond this

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limit, he would, he thought, be exceeding his powers.

327. The supervision given by superior officers in the Accounts Department over public works objectionable items statements was as follows: These statements were put up to the gazetted officer who was passing the accounts, and that officer glanced through them to see that there was nothing abnormal in the incidence of payments nor any impropriety of language, that there was nothing calling for further special action and that there was nothing *prima facie* unreasonable in the objections. He admitted that a very large number of unreasonable objections were set up, some of which might escape notice, but it was the recognized duty of the officer to see that the objections were reasonable in themselves and were expressed in reasonable language.

328. The removal of the restriction placed on an Executive Engineer by the Public Works Department Code in regard to the making of advances to contractors was, he thought, a matter for the controlling officers to decide, as were all questions in regard to the latitude to be allowed to the Executive Engineer. The accounts officers were merely agents of the controlling officers, and it was they who had laid it down that advances to contractors should be limited to a certain amount; the accounts officer had only to see that the rule was enforced. There was no special sanctity in the rule from the accounts point of view, provided adequate safeguards for recovery were adopted.

329. He did not think there was any objection to the proposal that the Executive Engineer should be relieved of certain minor duties by the allotment of his annual grants for repairs in the form of a lump sum for each building, which sum he would be entitled to spend without the necessity of preparing estimates detailing the nature of the expenditure involved. It amounted simply to substituting a standard grant (what is called a 'fixed contract grant' on the civil side) for an annually recurring one. He considered that there was a large amount of time wasted in compiling these estimates year in and year out and in obtaining fresh sanctions for them. They ought, after a certain length of time, to become standardised.

330. The main benefit to be obtained from estimates and accounts was that after a time it was possible to lay down a certain standard of expenditure, which, for a period, at least, could be held to be appropriate. Having established such a standard, it was useless to repeat annually the work that was necessary in establishing it. Thus if the cost of repairing a building had been Rs. 50 a year for the past five years, it could normally be concluded that it would be Rs. 50 for another five years. He suggested a periodical fixing of such standards, a five years' contract grant being given as was done on the civil side. Some such system might, he thought, be adopted in the Public Works Department with great advantage, as it would afford considerable relief to the engineer. On the civil side various civil officers were given fixed contract grants for five years, and they had absolute discretion in regard to the spending of this amount upon the various objects indicated as within the scope of the grant. Lump sum grants should also be placed at the disposal of Executive Engineers for minor works and repairs, even though this might lead to a further sub-division of accounts. Mere accounts difficulties, however, should not be allowed to stand in the way of executive facility.

331. The witness remarked, with regard to a suggestion that an Executive Engineer might be permitted to utilize that portion of his budget grant which he expected to lapse at the end of March on works which it was proposed to undertake in the next financial year, that lapses on the Public Works Department budget as a whole did not invariably occur. Lapses occurring in certain districts owing to special circumstances, e.g., plague, famine, etc., were often utilized in other divisions which had found that they were able to push on their works more rapidly than they had anticipated and were hence clamouring for funds. Whenever funds were available owing to lapses elsewhere the Executive Engineer who

required extra money usually got what he wanted. Thus the savings of one division were utilized in another, as far as possible, by the transfer to the latter of the funds which the former had not been able to utilize.

332. He did not altogether understand the exact object of the proposal that, in order to avoid lapses, it should be made possible for funds to be carried over from year to year since an officer could continue his work in the following year, pending receipt of orders on the budget, subject only to the restriction that the monthly expenditure should not exceed one-twelfth of his previous average annual expenditure. There was therefore so far as he could see no object in carrying forward these budget balances as there was no unreasonable restriction on the Executive Engineer's expenditure. The procedure of audit in such circumstances was to enter the expenditure in the statement of irregularities for remedy. In certain cases, so far as his recollection went, as, for example, in the case of repairs, audit raised no objection for the first three or four months of the year. In certain other cases audit called for prompt and adequate appropriation of funds. He thought that the latitude allowed to the Public Works Department in regard to expenditure was sufficient, but admitted that objections in regard to such matters were sometimes overdone by the Audit Department.

333. In regard to the suggestion that, as the 31st March, the date fixed for the termination of the financial year, was wholly unsuited to the Public Works Department as it occurred in the middle of the working season and hence prejudiced the execution of works, a later date might be adopted, he explained that the whole of the imperial accounts were supposed to be closed on that date and that grants are dealt with on that basis. There would, however, he thought, be no insuperable difficulty in acceding to the suggested alteration so far as the Public Works Department was concerned. If, for example, it was decided that the Public Works Department financial year should terminate at the end of May, the audit office could always take ten-twelfths of the annual expenditure for budget purposes and as a basis for its accounts, showing the public works accounts for the general financial year, and also for the Public Works Department budgeting year, as separate items. At the same time it had to be remembered that the working season was not the same in all provinces. In Sind, for instance, the working season terminated with the advent of the hot weather at the end of April.

334. With reference to a proposal that the present system of conducting audit in a central office should be done away with altogether, and that a system of travelling audit should be substituted, he explained that it was necessary to distinguish between audit and accounts, and that accounts would have to be submitted for compilation and inclusion in the general imperial accounts. Audit by the agency of a travelling staff was tried in the Bombay Presidency by Major Le Bretton in the nineties or later eighties, but was given up. The main difficulty was that only a low-paid staff could be engaged on the work and that there was much disparity of treatment, while the system entailed very little, if any, gain. There would also, he thought, be constant friction between the Executive Engineer and the subordinate audit staff which had to deal with that officer's accounts, and he did not think that the system could suitably be applied to the Public Works Department, in spite of the fact that local bodies had adopted it. He had not himself dealt with the local funds audit or municipalities' accounts, but from inquiry he had concluded that this method would be inappropriate to the accounts of the Public Works Department.

335. (Sir Noel Kershaw.) He did not think that a system of travelling audit would result in a reduction of the volume of audit objections by reducing correspondence and enabling personal explanations to be obtained from the Executive Engineer, since these objections were chiefly due to want of estimates, which were probably being held up in some controlling office. These

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objections are also often due to want of appropriation and want of revised estimates. He was very much opposed to the travelling audit system for several reasons, the chief of which was that audit would have to be conducted by a subordinate agency and that in a very short time the Executive Engineer's establishment would be in a state of friction with the auditors. The reason why the system of travelling audit could be enforced in England was that in England there was both a different climate and a different class of man. He had done inspections all over India at different times of the year, and he considered that, as touring during the hot weather inconvenienced even superior officers, the much greater discomfort which would be caused to the subordinate staff should also be recollected. In the present inspecting accounts subordinate staff, the maximum pay of the senior man was about Rs. 200 to Rs. 250 a month. Then there were *chaprassis* who were very much more lowly paid, and who found constant touring both a trial and an expense.

336. (*Mr. Kent.*) In considering whether *chaprassis* appreciated touring on account of the allowances they got, a distinction should be drawn between a district *chaprassi* and an accounts office *chaprassi*. So far as witness knew the accounts office *chaprassi* had very little claim on the local people. His own men always shirked touring either by taking leave or by pleading indisposition.

337. He did not think a subordinate travelling staff of auditors for the Public Works Department would either give satisfaction or would tend to decrease the amount of work in the Executive Engineer's office now complained of, while, if a man competent to accept the Executive Engineer's explanations were deputed for the work, the expense of the system would be considerable. He believed that travelling audit would prove more expensive, would lead to more friction and irritation, and would be less efficacious than the present system. He admitted that his statements were based on the supposition that a man drawing a salary of only about Rs. 200 per mensem would be in charge of the travelling audit establishment.

338. (*Mr. Mackenzie.*) In regard to objectionable items he explained that the initial objection was raised by the auditor. All auditors were divided into auditors and sub-auditors. A sub-auditor did the book-check of the accounts, i.e., he compared the figures, and if he noticed for example that the expenditure on any work exceeded the amount sanctioned he noted the excess and passed it on to the auditor, who examined it and embodied it in the statement of objections, which he then submitted, with the rule and a note as to the action necessary, to the gazetted officer, who decided whether the objection should stand or be amended. In routine cases the sub-auditor was the initial objector, but in all important or doubtful cases the auditor was responsible for the objection. The auditor could alter, if necessary, the statements of the sub-auditor, after perusing the rules and taking the circumstances of the case into consideration. But in going through the detailed accounts again it was generally the case that both the auditor and the gazetted officer added to the objections noticed by the sub-auditor. It was not usually the case that the objections were reduced. The gazetted officer decided whether the explanation of the Executive Engineer should be accepted, but in routine cases sanction was generally accorded without delay and the objection dropped.

339. A travelling auditor would not be competent to deal with cases of the nature referred to in the objection statements, and therefore the travelling audit system in the Public Works Department would not reduce the number of cases that went up to the gazetted officer for decision. Travelling auditors would have no power to waive objections. In a number of cases the Executive Engineer could merely state that he had passed the estimate to the Superintending Engineer, thus absolving himself from responsibility.

340. As normally an auditor did not intervene in the case of rates, except in cases where the Executive Engineer was bound under rule to report an excess in rates to higher authority, such as the Superintending Engineer, he considered that it was not necessary to consider the suggestion that the Accounts Department should not be allowed to interfere with an Executive Engineer in regard to rates so long as the latter was working within his totals or sub-totals. As stated before, an auditor, when raising such an objection, simply acted as an agent of the controlling officers. He merely pointed out that one of their requirements was not being fulfilled. It was necessary to recognize this fact in all charges brought against audit, as in the majority of cases audit did not function as an audit officer but merely as an agent of the controlling authorities with a view to enforcing the rules framed by the latter. Audit would, he considered, be wrong if it went beyond this, as it was in no way concerned with rates until the amount sanctioned was exceeded. Its function was solely to confine itself to pointing out abnormalities and bring them to the notice of the deciding authorities. Audit had done its duty so long as it informed the Superintending Engineer of such cases. The classification of objections, he explained, was broad, and it was not possible to state precisely what items should come under this head. There was, he thought, no object to be gained in differentiating between items in a more meticulous manner.

341. The personality and training of the accounts officer made a considerable difference. He thought that the spirit formerly displayed by certain accounts officers of trying to find as many objections as possible was dying out. He added that the tendency that formerly existed in the Public Works Accounts offices of regarding public works as intended primarily for purposes of accounts prevailed in all accounts offices, and there was a tendency to demand that everything should be done to meet the convenience of the audit officer. This tendency was one of the difficulties with which an audit officer had to deal in managing his staff.

342. (*Rai Bahadur Ganga Ram.*) He was unable to say how much had been saved by transferring the public works accounts to the Accountant-General's office, as no figures had been worked out.

343. The date fixed for the submission of accounts used to be the 20th of each month, but was now the 5th. The alteration was made in accordance with the general principle of speeding-up the accounts. He thought that the proposal that accounts should be submitted quarterly instead of monthly would lead to a great accumulation of work rather than to an automatic working out of objections. The strength of the staff in the accounts office was calculated on the assumption that it would deal with a month's work, in a month, and if three months' work were suddenly thrown upon it, the strength would have to be increased. He admitted that quarterly objections did work themselves out to a certain extent, and that for this reason certain quarterly and half-yearly statements were now submitted to government by the Accounts Department, instead of monthly statements as formerly. The same procedure might perhaps be applied to the Executive Engineer's accounts and there would probably be no real harm in it, but it would be opposed to the generally recognized principle that objections should be raised as soon as the irregularities occurred, and that such irregularities should be promptly remedied and not allowed to continue as might happen if objections were raised only quarterly. In practice, however, he was not certain whether any very useful object was served by taking up objections every month.

344. His opinion that contract work was usually more expensive than departmental work was based on the fact that ever since he had been in the audit office contractors' rates had been rising; he had, however, no practical experience of the two methods. The departmental method of construction, where the Department supplied its own materials and employed its labourers direct on muster rolls must, he thought, be cheaper than any other. It was true that the records of the Accounts Department showed that rates and prices had gone up

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everywhere in India and not only in the Bombay Presidency, except possibly in Burma and certain remote localities, where communications had improved and populations increased or settled down.

345. He was unable to give any information tending to show that the direct employment of labour by the Public Works Department had been generally given up throughout India, but he had, during his service, gained experience of nearly every province in India and could state therefrom that the tendency of Indian operations was, wherever contractors were available, to abandon departmental construction in favour of contract. There were, however, some parts of India where contractors were practically non-existent. Rates had risen everywhere, but he thought that the tendency of contract-work was to stimulate this rise since any increase of rates was in the contractors' interests.

346. (*Mr. Kent.*) As he was convinced that the more extensive employment of contractors had led to increased rates, he thought it would be permissible, from an accounts point of view, to allow engineers, in estimating the cost of works, to treat the rates they entered confidentially and to give to contractors tendering only a rough lump sum estimate, and a schedule showing the quantity of materials required for the work. These estimates should never leave the office of the officer who prepared them, and so long as the confidential figures were entered in the record of expenditure, the Accounts

Department could raise no objection in regard to the system on which tenders were called for.

347. In connection with his former remark that annual repair estimates were unnecessary, and that he was inclined to advocate the provision of a specific sum for this purpose for a period of years, he admitted that he was speaking merely as an outsider and that his views on the subject were of value only in so far as such an individual could frame an opinion.

348. In connection with the Public Works Department establishment charges he explained that it was not usual in the Accountant-General's office to calculate these charges on the actual cost of construction *plus* establishment, direction, accounts, etc. Establishment percentages were worked out on the proportion borne by the actual cost of establishment to the total cost of the works and repairs executed by that establishment. The meaning of a statement that the cost of establishment was 20 per cent. was merely that the expenditure on the regular establishment employed was 20 per cent. of the amount spent on labour and materials. The actual cost of establishment was not added to the latter in obtaining the percentage, *e.g.*, in the case of a work costing one lakh of rupees for which the establishment charges came to Rs. 20,000, the percentage that the cost of the establishment would bear to the whole expenditure was calculated in the Accounts Department on the actual cost of the work (one lakh) and not on that cost *plus* the cost of establishment (one lakh and twenty thousand).

At Bombay, Thursday, 11th January 1917.

PRESENT :

F. G. SLY, Esq. C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

C. S. COBB, Esq., M.V.O.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member:—

R. J. KENT, Esq., Chief Engineer and Secretary to Government, Bombay.

D. G. HARRIS, Esq. (*Secretary*).

C. J. HANSOTI, Esq., Superintending Engineer, Bombay.

Written Statement.

349. (I.) **Economy and suitability of methods of execution of public works.**—The methods at present adopted for the execution of civil works are on the whole economical and suitable except in case of small outlying buildings like police out-posts and local board schools or wells in outlying villages. It would be more economical to entrust these works to the Department or agency concerned for execution and maintenance.

350. (II.) **Encouragement of other agency.**—Under the existing system, private enterprise finds its field in the contracts given out for execution of works under the supervision of public works officers. Works are generally given out by contract if capable and reliable contractors are available and come forward to undertake them at reasonable rates. Where no capable men are available, as is often the case in the *mofussil*, or they ask for exorbitant rates, works are executed by departmental agency or by giving them out by piece to different petty contractors.

(2). Except in the presidency towns like Bombay, trained or skilled contractors with sound professional knowledge and possessing the requisite resources as regards men, money and implements are not generally available at present, and no Bombay contractor would go out to the *mofussil* for work of the nature and cost usually carried out there unless they could expect to have a high percentage of profit. The employment of large

firms would not, therefore, be in any way economical and is certainly likely to result in less efficiency of work. Close supervision is required of the work done by most contractors, and they are often required to be guided in their work.

(3). There is scope, however, for the further encouragement of private enterprise by the more general adoption of the system of work by contract in preference to that by departmental agency wherever possible. I would, however, deprecate the giving out of all works in a district wholesale to one individual or firm, as it is likely to become a sort of a monopoly with the same individual or firm due to the investment required for tools and plant, and the result would, under the circumstances, be an increase in cost and deterioration of the efficiency and quality of work, as competition would be difficult to get. Even under the present system, it is at times found that contractors combine and tender for works and materials at high rates or decline to supply road materials broken to the specified size, and departmental agency has then to be employed to break the combine or to get materials of the requisite size and quality. If such an agency did not exist, the hands of government would be forced, and they would have to give the higher rates demanded, and to accept materials not in accordance with specifications. The enforcing of specifications results often in delay. Again, big contractors expect large profits, and I have often found it more economical

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to give out works by piece to smaller men who are satisfied with smaller profits. I would not, therefore, advise any sudden or sharp departure from the present methods, but would advocate the giving out of work by contract under departmental supervision wherever possible.

(4). Under the circumstances described above, it is necessary to keep up the departmental agency for supervision as also for execution of work whenever necessary. Its task may, however, be lightened by giving larger powers than exist at present to those district local boards that employ an efficient staff, to execute their works by their own agency. It may also be possible to entrust the construction and maintenance of small and less important government works in places where no other works exist under the Public Works Department agency to such local boards. For the maintenance of small or single works lying in out-stations, either the agency of the department concerned or that of the district local board may be employed.

351. (III.) Changes in organization.—The present system of recruitment of the Public Works Department engineers requires to be modified with a view to the larger employment of Indian college engineers on the same salary as the engineers recruited from England. The present division of the service into provincial and imperial should be done away with, and all engineers should be classed as one, as they used to be before 1893, and should form the Indian Engineering Service. This will ensure better *esprit-de-corps* by removing any possibility of the suggestion of inferiority of the provincial men, and improve the emoluments of the latter which are unsatisfactory at present and make them discontented.

(2). As capable engineers are being turned out by the Indian colleges, and as Indians are naturally in a position to be more in touch with Indian conditions, and to understand and control Indian establishments and labour better than non-Indians, it is desirable that the proportion of Indian engineers in the Department should be increased, and I would suggest that it should be 60 per cent. of the total strength. The recruitment in England may also with advantage be by open competitive examination from graduates in engineering of the Universities of Great Britain and India.

(3). No improvement is necessary in the class from which the subordinates of the Public Works Department are drawn except that the employment of military subordinates in the civil branch may be discontinued as unnecessary and unsatisfactory. The civil subordinates are mostly drawn from the engineering colleges and are generally satisfactory, but the scale of the pay of the upper subordinates should be improved, and the long wait in the second and third overseer grades should be curtailed to five years in all instead of eight to attract

the best of the successful students. The promotion from the lower subordinate grades should be restricted and confined to exceptionally able and efficient men of good training.

352. (IV.) Relations with other departments and sub-branches.—The relations of the various branches of the Department among themselves as well as with other departments are satisfactory. I think, however, that it would conduce to greater economy and rapidity of construction if works designed by sanitary and other experts are entrusted for execution to the district Executive Engineers who have better local knowledge and command of resources than the officers appointed specially for the work in the expert branch.

353. (V.) Decentralization.—The power of selected Executive Engineers to sanction estimates may be increased to Rs. 5,000 and that of accepting tenders to Rs. 10,000, the Superintending Engineer's powers being proportionately increased. Sub-divisional officers should, under the sanction of the Superintending Engineer, be empowered to enter into contracts up to Rs. 200 for each work or sub-work, the limit being increased to Rs. 500 in the case of Assistant Engineers of two years' standing.

The provisions of the Public Works Department Code are not, generally speaking, unduly restrictive; but some relaxation is necessary in them—dispensing with the detailed estimates for current repairs to ordinary buildings and recognizing the agency of the lower subordinate establishment as competent for recording measurements of works except for the final bill.

354. (VII.) Education.—The system of education in the only government engineering college at Poona in the Bombay Presidency is, I think, organized on a sufficiently broad basis, and is adequate to provide fully-qualified engineers for government and other agencies. The college, however, is in need of a larger patronage from government to attract the best possible students, as the other large employers like railway companies and manufacturing firms reserve their patronage for European engineers. Instead of the one engineer appointment guaranteed to its students, two, and more if possible, should be guaranteed, and the grade in the upper subordinate establishment to which the other successful students are appointed should be changed to first or second respectively in the case of men who have passed in the first or second class.

355. (VIII.) Practical training.—I think it would be well if a few of the Indians who have received their scientific training either in English or Indian colleges are appointed to the Department for practical training for a year.

MR. C. J. HANSOTI called and examined.

356. (President.) The witness stated that he was a Superintending Engineer of 24 years' service in the Public Works Department, which he had spent in the Buildings and Roads Branch, except for two or three years on special irrigation works.

357. The contractors available in the districts in which he had served were not technically trained, but were ordinary capitalists employing *mistris* who had learnt a certain amount about construction work by experience. They were all merely petty contractors. Large contractors were ready to take up buildings costing as much as a lakh of rupees or more—petty contractors only those costing up to thirty or forty thousand rupees. There were a certain number of contractors in the Surat district who were able to undertake the construction of the larger works. They required supervision as they did not employ any engineering staff but only *mistris*. He preferred to execute works by contract rather than by departmental agency wherever suitable men were available. As to what steps might be taken to encourage contractors, he suggested that they should be given petty works to execute until, as they gained experience, they could be entrusted with larger works. This was, in fact, analogous to the present system although occa-

sionally works were executed departmentally which could without risk have been transferred to contractors. In the ordinary Executive Engineer's charge there was not enough work for any number of large contractors, the expenditure usually varying between three and four lakhs of rupees per annum, of which between one-third and one-half was for original works and the balance for repairs. Works costing more than Rs. 5,000 were termed "major" works, and probably two-thirds of the original works fell under that classification. There was always a danger of contractors combining, and forcing up rates unduly. He had recently had practical experience of this in the Kaira district in the case of a large work. The contractors had formed a ring and demanded exorbitant rates, and he had had to reject all the tenders and order the sub-divisional officer to execute the work by piece-work, which he had succeeded in doing. For this reason he thought that the Department must always be maintained in such a form as would enable it, if necessary, to undertake work departmentally and thus break up such combinations.

358. The present system was, he thought, economical. The Public Works Department rates compared very favourably with those paid by private mill-owners and

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generally rates for local board and private work were approximately the same as those paid by the Public Works Department, although their works were not so efficiently executed as those of the latter. Referring to the establishment charges of the Public Works Department he pointed out that, if a man built a private residence, he did not usually employ any skilled agency to supervise the construction although he probably spent a certain amount of his own time on the work. For professional supervision he probably employed only a *misiri*, and consequently did not pay as much as the Public Works Department, but the resulting work was, of course, inferior.

359. The average area of an Executive Engineer's division varied between four and five thousand square miles. There were, on an average, five or six sub-divisions in each Executive Engineer's charge although in some districts there were six or seven, even eight. A sub-division was generally in the charge of an upper subordinate and occasionally of an Assistant Engineer, only rarely was it in the charge of a lower subordinate. The annual expenditure of a sub-division was from fifty to sixty thousand rupees.

360. He was of opinion that the upper subordinate class was quite satisfactory. With reference to the suggestion made to the Committee that the theoretical training of upper subordinates was too elaborate, and that they were deficient in practical knowledge, he stated that they naturally required training for some time when they first came from the college, but that in about a year they gained the necessary experience. Upper subordinates were certainly more highly trained than was actually necessary for the work they were required to do, but in his opinion all that was needed was a little more practical experience to start with. He suggested that their pay should be enhanced in view of the facts that the cost of living had increased and that men who went into other businesses were better paid. He doubted whether government service attracted the best men, and stated that there had been cases in which engineering graduates standing high in their examinations had refused to enter it, preferring to take up private practice or native state service.

361. His experience of the lower subordinate establishment had also been satisfactory, and he did not agree with the opinion that the "works" establishment was inferior and unreliable, nor would he recommend that any of the latter should be made permanent. It was true that they continued in service for a considerable time, but he did not think that even if they were made permanent there would be much difference in the standard of the work produced. At present they could be dismissed at any time if they did not work well and hence he thought that the Executive Engineer had a greater hold over these men than if they were on the permanent staff. Nor did he think that it would lead to better results if the lower subordinates were either reduced in number or abolished altogether, and more upper subordinates employed in their place. He did not agree with the majority of the criticisms levelled against the lower subordinate establishment, and considered that the existing organization was as good as could be devised for the purpose in view.

362. Plans for work required by municipalities were generally approved by the Public Works Department, and if costing more than a certain sum the works were usually entrusted to that Department for execution. There was no compulsion in the matter, but municipalities generally came to the Public Works Department for the execution of large works and the approval of plans and estimates, except in cities like Ahmedabad which had a big municipality with an engineer of its own; in Surat the municipality always applied to the Public Works Department for the important works.

363. District boards were bound by rule to hand over certain classes of works for execution by the Public Works Department. The class of roads generally looked after by the local boards was confined to small rural roads, more or less country tracks, some of which were bridged, but rarely metalled. The agency for the maintenance

of local board roads depended upon the opinion of the officers concerned. He had known some cases where local boards had wished to take over roads from the Public Works Department, and others in which they had tried to hand over such roads to that Department. He suggested that local boards should, to some extent at any rate, employ their own staff and manage their own works. They could now execute works costing less than Rs. 2,500 and if they employed a better agency their powers might very well be increased. He admitted, however, that this system would lead to duplication of staff to some extent, and suggested that certain government works in outlying places should also be handed over to the local boards. He would not recommend that main or important roads should be handed over to the district boards.

364. He did not approve of the proposal which had been put before the Committee that the Roads Branch should be separated entirely from the Buildings, and that there should be two separate branches in the Public Works Department—one of architects who would be responsible for the buildings, and another of general engineers who would be responsible for roads and other works, considering that it would be a very expensive arrangement as there would be two separate establishments working in the same area. This would be very inconvenient and although it might be suitable for a place like Bombay it would not work well in the *mo-fussil*. The experiment might, however, be tried in a building centre where there were a large number of buildings to be constructed.

365. With regard to the suggestion that the department which occupied a building might be given a grant and made responsible for the ordinary current annual repairs, he doubted whether such an arrangement would be either a very satisfactory or an economical one. For the repair of buildings scattered over a district, however, he suggested that either the agency of the occupying department or that of the district board should be employed.

366. The power of technical sanction of a Superintending Engineer was limited to Rs. 20,000 and this, he thought, should be increased to Rs. 50,000. On general principles it would conduce to greater efficiency if these powers were enlarged. The power of technical sanction of an Executive Engineer was limited to Rs. 2,500 and he suggested that, in the case of selected officers only, such powers might be increased to Rs. 10,000. Junior Executive Engineers might continue with the lower powers.

367. He had never, as an Executive Engineer, found his accounts works a very heavy burden nor prejudicial to his executive work. His accounts work had occupied about two or three days each month, but even on those days he had not been wholly employed. He did not think that the accounts system was so complicated as to interfere to any great extent with his executive work. He thought, however, that it might be simplified in certain details, and quoted the preparation of works abstracts as a case in point.

368. He had had no occasion to complain that the rules prohibiting the local purchase of stores were prejudicial to efficiency or expedition. He admitted, however, that he had to apply to government for sanction to the purchase of certain articles, which caused some delay.

369. He was in agreement with the suggestion that the preparation of detailed estimates for all repairs to buildings should be done away with, and that simply a lump sum should be given to be spent at the discretion of the Executive Engineer. This procedure would, he thought, obviate a lot of office work.

370. At present for every building to be constructed plans and estimates had to be prepared, and there was always a considerable amount of such work in progress in the office of an Executive Engineer. It did, sometimes, happen that designs had to be prepared more than once, in some cases three or four times, owing to an officer changing his mind, but he did not think that it could

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be said that such a state of things was general or that it constituted a grave inconvenience to the Department.

371. With reference to the suggestion put forward before the Committee that an estimate should be split up into different classes of work, and tenders called for each—for instance that instead of a contract being given for a whole building tenders should be accepted from a carpenter for all the wood-work of the building and from a mason for all the masonry work—he stated that that was exactly what was done at present under the piece-work system, under which wood-work would be given to one contractor, masonry to another and so on.

372. He did not think that it would be possible to arrange within the Department for the provision of one or two years' practical training for all the students who passed out of the Poona College but they could certainly arrange for a certain percentage. If the number which passed out of the upper course of the Poona College were limited to twenty-five or thirty, practical training for them could probably be managed. He could not say whether the students would accept the offer of such training if they were given an option in the matter, but he believed that a large number of them would do so. The students should, he thought, be given a living wage during the period of practical training.

373. (*Mr. Cobb.*) He certainly thought that there was scope for an extension of the contract system, and suggested the issue of general instructions that works should be done by contract as far as possible. Some officers appeared to prefer to do their works departmentally. He would not give the maintenance of roads to contractors except as regards the supply of materials. In the case of a long stretch of road of fifty miles or so it would be impossible to give the repair work on contract as there would be so many detailed points which would require attention, and if the contractor did not work properly there would always be trouble and differences of opinion. The repairs to buildings would be an easier matter to deal with than the repairs to roads. Less trouble would also be entailed, as a *mistri* could be employed for such work, which would then be executed on the piece-work system. Only when suitable contractors were not available would he do the work departmentally. He was of opinion that the number of contractors was and would go on gradually increasing.

374. (*Rai Bahadur Ganga Ram.*) He had graduated from the Poona College of Engineering and had passed first on the list in his year. The second man on the list got in as an Apprentice Engineer; the third and fourth went to Mysore. Seven passed in the new course, and about forty in the old course. Some of these forty had taken up private practice and some were employed in native states, while a few abandoned engineering altogether and joined the Revenue Department as *tahsil-dars*.

375. He stated that he had been an Executive Engineer, Buildings and Roads, for a long time. The largest building actually constructed under his supervision was one costing about Rs. 2,00,000 at Ahmedabad. This building—the Science Institute—was designed by the Consulting Architect. The largest building which he had designed cost about Rs. 60,000. All designs were submitted to the Consulting Architect, the limit below which this was unnecessary being about Rs. 20,000. Government, or in certain cases, the Superintending Engineer, decided which buildings should be designed by the Consulting Architect. Sometimes there was a difference of opinion on the subject and consequently correspondence ensued. No difficulty, however, had been experienced in regard to the system in general, as it was merely a matter of giving the architect information as to local conditions. The Consulting Architect did not interfere in every design, but only when government saw that there was an important building to be constructed and consequently desired his advice.

376. He had meant "daily labour" when he had referred to "departmental agency." The piece-work contractor generally made his own arrangements for materials, but in certain cases they were supplied by the Public Works Department, and the cost was deducted

from his bills. If the contractor were a good man he could be entrusted with the supply of materials which were usually not manufactured by the Public Works Department but purchased locally.

377. There was an irrigation division at Ahmedabad. The irrigation rates were just about the same as the building rates; the railway rates were generally higher, but the witness could give no reason for this, nor could he state whether the railway work was superior in quality. It was done with great expedition and contractors always preferred railway work as they could get much better profits there.

378. He had not experienced any difficulty in the purchase of stores through the Director General of Stores. He thought that the suggestion that the Director General of Stores should be located in India was a good one, and if such a course were adopted he did not think that it would lead to a rise in the prices of stores.

379. He did not consider that the overseers turned out by the Poona College were more highly trained than was really necessary.

380. As to the suggestion that the sub-overseer class should be abolished and a *mistri* class substituted, the latter being taught only the rudiments of drawing, estimating, etc., he did not think that these men would ever come up to the standard of the lower subordinate establishment as they had not so much intelligence. *Mistris* were not required to do handicraft work only, but supervision work also.

381. He divided the lump sum grant placed at his disposal according to the requirements of each district. Each Executive Engineer supplied him with his requirements and on that basis he distributed the grants. In general the percentage of capital cost allowed for repairs to buildings was about one per cent. but it depended very much on the nature of the building concerned.

382. He could not suggest any way of reducing the correspondence work of the Executive Engineer, all of which he considered was necessary. Neither could he suggest any considerable reduction in the accounts work. The accounts were submitted on the tenth of each month and there was a little difficulty in that respect. It would be a relief if instead of monthly there were quarterly accounts, and he did not think that the adoption of such a system would impair the efficiency of the Department. In this way the number of objections would be considerably lessened, as many of them would dispose of themselves automatically.

383. (*Mr. Mackenzie.*) Even if departmental and piece-work were very much reduced, and true contracts substituted, he did not think that very much benefit would be derived therefrom except perhaps a small reduction in the lower classes of establishment; the Department as a whole would not be much relieved and the same superior supervision would be required, even if the contractors employed a better supervising agency themselves. As far as the necessity for the departmental establishment was concerned there was little difference between the regular and petty-contract systems except in the matter of accounts nor did he think that the introduction of the regular in place of the petty-contract system would be of any very great value to the people in general as training them in habits of self-reliance and independence; there was, as he had said, very little difference between the two with the exception that the regular contractor was usually the more moneyed man. He did not think that large contractors would be able to afford to utilize trained engineers if they took up contracts for buildings worth Rs. 50,000 or Rs. 1,00,000; indeed it was doubtful whether large contractors would compete for work worth only about Rs. 50,000. There were no men of the stamp required in the *mofussil*. The obstacle in the way of small contractors was lack of capital, and they lived in many cases from hand to mouth depending entirely upon the payment of their bills. They had to pay the ordinary rate of interest, as well as in some cases a share of their profits, to the money-lender. Large contractors, however, had generally capital for the work they undertook and could command lower prices by advancing money. With regard to the suggestion that

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the Public Works Department should also pay ready money at frequent intervals he thought that it would be inconvenient if the engineer had to make payments so often. In certain cases they were made fortnightly and occasionally weekly, but in general monthly payments were the rule. It took a certain amount of time to dispose of bills, which had then to be passed by the audit officer.

384. Sub-divisional officers were not allowed an imprest, but had a cash account. They could not pay more than Rs. 10 or so in cash. In rare cases, however, they were empowered to pay cash up to Rs. 50. They submitted their accounts monthly.

385. There would be some risk if advances were made to contractors, but he doubted whether any loss would be entailed to government by such a system provided that it were applied to approved contractors only on proper security. It was possible that it would facilitate work and result in some reduction of rates.

386. On its being pointed out to him that in Madras nearly all the roads in the presidency were in the charge of local boards, who employed men on Rs. 800 or Rs. 900, he stated that this was not the system in Bombay where the local boards employed only overseers, but he thought that a start might be made in that direction. Some local boards were, however, begging government to take over their roads as they had no proper establishments, and the Collector of Ahmedabad had asked the Executive Engineer to take over a road. He believed that a scheme which would allow local boards to employ a superior establishment was under consideration by government, but he thought that its adoption would lead to overlapping. Even if the Public Works Department were relieved of their roads, government supervision would still be required.

387. If the Public Works Department were relieved of all roads and of all small buildings in out-of-the-way places, and had only to deal with big buildings, there would be practically nothing left for the Department to do. He did not think it would be to the interest of government to abolish the Buildings and Roads Branch, because the aggregate cost would not be reduced and there would be a loss in convenience and efficiency.

388. To entrust local boards with the execution of their own buildings and the maintenance of their roads might prove valuable as training in self-government, but he doubted whether the members of such bodies would take the necessary trouble to inspect works. His experience of municipalities was that members would not actually go out and see things for themselves—at any rate this was the case in Ahmedabad—they left every thing to their officers.

389. There were type designs for most buildings, which were only altered to suit local circumstances or requirements. In the case of an important or costly building the designs were given to the Consulting Architect; otherwise they were done by the Executive Engineer.

390. (*Sir Noel Kershaw.*) As an Executive Engineer he had been employed in signing forms and accounts for about two or three days in the month and the time actually spent in the month on such work was five or six hours altogether. He had to sign his name about three or four hundred times in those five or six hours. Some of the documents were merely compilations which did not require looking into by the Executive Engineer and his signatures to which could, in his opinion, be easily dispensed with.

391. When work was to be commenced the fact was advertised in the papers in order to attract contractors. He deprecated the giving out of all works in a given area to a single firm as it would create monopolies. Petty contractors were supplied with tools and plant by government, and in the case of a work which required rollers or costly plant they were supplied with these things also.

392. He stated that there were few district boards in the Bombay Presidency which employed an efficient staff and the employment by them of such a staff would

lead to overlapping. The witness had no idea how the system worked in Madras. If the energies of the local boards were directed solely to the outlying parts of the district, and of the Public Works Department to the inlying parts, overlapping in big places and at headquarters would be obviated, but the Public Works Department had at present very little work to execute outside headquarters.

393. (*Mr. Kent.*) With reference to the statement in his written memorandum that contractors with sound professional knowledge were to be found in Bombay he explained that he was referring to firms of architects and engineers in Bombay and not to contractors proper. He did not know of any persons who were trained contractors in the real sense of the word.

394. In suggesting that a considerable proportion of the work of an average district might be transferred to the agency of local boards if they employed efficient staff he was referring to the local boards' own work, and did not mean that a proportion of the government work now carried out by the Executive Engineer should be transferred. The system would lead to a certain amount of overlapping and would not be altogether economical. He certainly thought that it would be necessary to retain government supervision even if the roads were transferred to local bodies employing efficient staff. As to what form this supervision should take and assuming that all the roads were transferred to local bodies who employed their own staff, he suggested that there should be a Superintending Engineer for every five or six such local bodies. His functions would be that of a travelling inspector and he would have to see that the work was properly done. It might be necessary to have one or two Executive Engineers under him. This would possibly be an improvement on the existing system, which latter, however, gave no cause for complaint.

395. The largest district he had ever held charge of was Ahmedabad. As to what proportion of his time he had spent on actual supervision of work and what proportion on office work he stated that he had visited his works almost every morning, beginning at 7 or 8 A.M. and going on till 12 mid-day, and then spent from 2 to 5 or 6 P.M. in his office, that was to say about eight hours altogether, equally divided between works and office.

396. (*Mr. Mackenzie.*) In explanation of his statement that works amounting to Rs. 2,500 were submitted to the Consulting Architect, he stated that such works were not carried out by that officer but were sent to him merely for suggestions as to improvement in appearance, etc. He was not quite sure whether any definite money limit had been fixed.

397. (*Rai Bahadur Ganga Ram.*) The schedule rates were revised by the Executive Engineer once a year. In preparing these no percentage was added for the contractors' profits, but certain establishment charges were allowed. Personally he would be willing to allow 5 to 10 per cent. for such profits. These schedules were prepared from the actual cost of construction in previous years.

398. (*President.*) He admitted that certain graduates of the engineering college entered the Revenue Department and added that they joined that department direct from the college. Being a graduate of the engineering college was one of the qualifications for entry into the Revenue Department, which took graduates of science as well as of engineering. There was no harm in this, as men obtained a sound general training in the college. He did not think it desirable to prohibit graduates of engineering from entering another department.

399. The Executive Engineer exercised powers of appointment, dismissal and punishment only in regard to works establishment and office clerks. He had no powers over the lower subordinate establishment, although he could report them to higher authority or transfer them. He considered that this system worked well and that it was unnecessary to give more powers of punishment, etc., to Executive Engineers. There was no real objection to doing so but the necessity for the reference to a higher officer constituted a valuable protection for the lower

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subordinates. He did not think that this protection was so great as to deter Executive Engineers from report-

ing lower subordinates and to force them to content themselves with inefficient staff.

F. ST. J. GEBBIE, Esq., Chief Engineer, Sind.

Written Statement.

400. (I.) *Economy and suitability of methods of execution of public works.*—As far as Sind is concerned I consider the methods at present adopted for the execution of civil works are in all respects suitable for the purpose for which they were devised.

401. (II.) *Encouragement of other agency.*—There is no existing system of private enterprise in Sind except house building in Karachi. In the past two or three years very many houses, meant for occupation by Europeans, have been built by Indian landlords and speculators, and I have watched the construction of most of these houses and flats. I have no hesitation in saying that if the work, even in the very best of these buildings, had been passed by any Executive Engineer in the Department, he would have got into the most serious trouble. I can give examples of this. About two years ago a certain firm in Karachi decided to build a bungalow for their manager. This bungalow was designed by an architect, who is an A.R.I.B.A., and was constructed by a local firm of contractors under the architect's personal supervision. Before the bungalow was occupied the manager asked me to inspect the upper verandah which he said he did not think was safe. I did so and found that it had sagged at both ends and the floor was cracked badly in many places. The flooring was reinforced concrete and can still be seen by anyone who wishes to inspect it. Quite recently all the tiles in the flooring of the ground floor rooms have had to be removed and replaced because the filling underneath had not been properly rammed and all the floors settled very badly. If work like this is done under the supervision of what is supposed to be a qualified architect, it may be imagined what the class of work is when it is left entirely to a contractor, nominally supervised by a landlord who knows nothing about building construction.

(2). In another case, a firm was building new offices which were ultimately to be a double-storied building, but in the meantime only the ground floor was being constructed. The roof was reinforced concrete and the whole of it collapsed, just as concreting was completed,

because the contractor had not troubled to see that the timbering rested on a solid foundation. This same contractor is doing similar work for this Department, and is doing it very well, but only because he is being supervised by competent engineers.

402. (IV.) *Relations with other departments and sub-branches.*—In Sind, at any rate, the relations between the Public Works Department and other departments of the administration are quite satisfactory.

403. (VII.) *Education.*—We are now getting a very satisfactory class of men as upper subordinates, but the lower subordinates are not quite so good, and I think the reason for this is the almost impassable line drawn between the upper and lower subordinate rank. It seems to me we would get better men as lower subordinates if this distinction were done away with and all subordinates had to begin at the bottom and work their way up, just as members of the engineering establishment have to.

(2). The Dayaram Jethmal Sind Arts College is the only institution in Sind which teaches engineering and, as the teachers are men of no particular professional standing, it is quite impossible for them to turn out fully-qualified engineers and architects. The direction and extent of improvement is obvious in this case.

404. (VIII.) *Practical training.*—I do not think adequate provision is made for practical training. Government might undertake to provide practical training on works, and the extent to which it could be provided would depend on the number of works in progress, but, to have any practical result, it would be absolutely essential that any one wanting this practical training should enter into some form of apprenticeship for a definite period. If they are allowed to come and go as they please they would learn nothing and only be a nuisance on the works. When I was in charge of the Jamrao Canal, one young man asked if he might be allowed to get some practical experience of irrigation work, but he stayed less than a week, as his idea of acquiring practical knowledge was to sit in the office reading files, etc. I could not order him to go out on works, but I could order him out of the office, so he went.

MR. F. ST. J. GEBBIE called and examined.

405. (*President.*) The witness stated that he was Chief Engineer to the Government of Bombay in the Irrigation Branch, and that he had had 23½ years' service which had been spent entirely in the Irrigation Department in Sind.

406. The Irrigation Department in Sind looked after buildings, but there were practically no roads, with the exception of one provincial road four miles long, and one local road twenty miles long. Ordinary buildings were looked after by the district engineer, but this formed only a very small part of his work.

407. There were altogether four architects of different qualifications in Karachi of whom two were Associates of the Royal Institute of British Architects, and one was self-taught. The witness had no information in regard to the fourth.

408. Private building work in Karachi was executed in various ways, but he had not much information in this connection. The work was mostly done by petty contractors, and the supervision carried out by the person for whom the building was being erected. There was practically no expert supervision at all.

409. He was unable to give any definite comparison between the rates paid by the Public Works Department and those charged by private enterprise.

410. The Karachi Buildings Division, which was devoted entirely to buildings, under the charge of an Executive Engineer, included the buildings at Hyderabad and in the Persian Gulf. He approved of the

proposal that this division should be in charge of an architect, and should be taken away from the ordinary Public Works Department staff.

411. The upper subordinate staff in Sind was quite satisfactory. He thought, however, that during their college course they spent too much time in learning theory, physics and chemistry, etc., which could be better employed on practical civil engineering work. His lower subordinate staff was not so satisfactory.

412. The ordinary works establishment in Sind consisted mainly of men called '*Derogas*' whose work was merely the supervision of labour. These men had no technical qualifications of any kind beyond the capability of making simple measurements. Some of this "works" establishment was employed continuously although engaged on a temporary basis. He was doubtful as to the advisability of forming this establishment into a permanent government service, because the men were unskilled and had no professional training. *Mistris* were usually selected from among the best masons.

413. A reorganization of the Department based on the permanent employment of a certain number of practical workmen such as masons, carpenters, etc., in the position of *mistris*, and the reduction of the present lower subordinate staff would not, he thought, work well in Sind, because the number of such workmen employed there was very small. It would not be worth while to make a special branch for that establishment in Karachi as so few men of that type were required.

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Rather than effect a reorganization in Sind, based on an increase in the upper subordinate staff, which he considered satisfactory, at the expense of the lower subordinates, he would prefer to abolish the hard and fast barrier between these two classes and make all the subordinates in the province start from the bottom and work their way up. This would not, he thought, result in any reduction of efficiency because at present the same class of man applied for both upper and lower subordinate posts. He was not sure whether, if all subordinates were in one class, it would still be possible to obtain such a good type of man as the present upper subordinate, but he was convinced that the type of lower subordinate would be considerably improved thereby.

414. His establishment in Sind was largely recruited from the Dayaram Jethmal College, and no lower subordinates were recruited from the Poona College of Engineering. Of his upper subordinates, some had been transferred from Bombay, and some were *Sindhis* who, having taken their L.C.E. degree, were appointed direct from the temporary establishment. The Dayaram Jethmal College was an aided private institution more or less subsidised by government. Four appointments were guaranteed annually to the engineering classes of this institution, one for upper subordinates and three for lower subordinates. The educational qualification for admission to the college was the school final or matriculation, and the length of the course was three years. Students thus passed out of the college at the age of about 22 years. He thought that the best of the students of this college compared favourably with those of the Poona College, but that in general the men of the latter college were better. He believed also that the Poona College took much older candidates, and that such men did not usually finish their course till the age of 25 or 26 years. From his own experience he thought that the Poona system was the better and turned out a superior class to that produced by the Dayaram Jethmal College, this being mainly due to the fact that the former college had a better teaching staff. In connection with the engineering training of boys, he thought that the most suitable course was to take them direct from school into the engineering colleges so as to facilitate the provision of a course of practical training after they left college and before they actually took up employment as engineers.

415. He had had experience as an examiner of the Dayaram Jethmal College, and confirmed the general complaint which had been made by other examiners that the students who graduated from that institution had a very deficient knowledge of English. This, he admitted, was rather against his argument in favour of such students entering an engineering college direct from school.

416. The system prevailing in the Bombay Presidency under which an officer could be transferred from the Irrigation Branch to the Buildings and Roads Branch, and *vice versa*, was, he thought, a bad one. He was in favour of having two branches absolutely self-contained, with promotion from top to bottom in each particular branch, but he was somewhat doubtful as to whether this could be arranged satisfactorily. It might happen, for example, that of two men of the same standing, one in the Irrigation and the other in the Buildings and Roads Branch, one might get quicker promotion than the other, and this might lead to discontent. Such discontent would have no legitimate basis, but it would probably exist.

417. He was in favour of a system under which all passed students of the colleges of engineering should have the right to undergo one, or perhaps two years' practical training in the Public Works Department, provided that a proper system of apprenticeship were introduced. He suggested that such students should enter into an agreement that they would undergo such training for a certain period, as was the system in England; he was, however, not quite sure whether it would be necessary to impose a penalty for breach of such an agreement. Judging from his experience of them, he thought that many of the students of the Dayaram Jethmal College would welcome a system under which they could be given

a practical training in the Public Works Department. He did not think it was necessary that all such students should be given a living wage, as some of them could quite well afford to keep themselves.

418. The accounts system in force in the Irrigation Branch was analogous to that in force in the Buildings and Roads Branch, but the amount of detail in the former was much less as it was concerned mainly with large works. He had no suggestions to make with regard to possible improvements in the present system, but thought that it was pretty clear that some improvement was required. The matter was, however, too technical for him to express an opinion on. It was difficult for him to say exactly what proportion of an Executive Engineer's time was spent on accounts, but he thought that it averaged two and a half hours a day which, in his opinion, was an unduly large proportion. He had no remedy to put forward for improving this state of affairs, but suggested that an expert should be deputed to look into the matter. If the whole of the monthly compilation and classification of accounts, together with the preparation of the monthly statements, were transferred to a separate central accounts' office, it would save the Executive Engineer a lot of trouble. The adoption of a system under which the accountant of each office would be the officer responsible for the accounts would also save a lot of trouble and time, and he was prepared to recommend it. The Executive Engineer would have to remain responsible that the measurement book entries and the vouchers for payments made were correct. Some Executive Engineers went into the question of the classification of accounts themselves, but others left this largely to their accountants.

419. The powers of Superintending and Executive Engineers in the Irrigation Branch were the same as those of similar officers in the Buildings and Roads Branch. His own powers were limited to Rs. 20,000, and he thought that further decentralization was desirable. A Superintending Engineer should be given powers up to Rs. 50,000 and an Executive Engineer up to Rs. 15,000 or Rs. 20,000. It was, however, necessary to restrict the powers of certain individual officers, and hence he was of opinion that, while further powers should be delegated to each class, local Governments should be allowed, at their discretion, to restrict them in particular cases as they saw fit.

420. (*Sir Noel Kershaw.*) His remark that the average time spent by an Executive Engineer on his accounts was two and a half hours a day throughout the month applied only to Sind, but he believed that the accounts work in the rest of the presidency was just as heavy, if not heavier; he had, indeed, always understood that this work was lighter in Sind than it was in Bombay and the Deccan. He had a qualified accountant whose salary was Rs. 80 rising to Rs. 450 per month. This accountant was quite competent to undertake the responsibility which nominally fell on the Executive Engineer. It would be a good thing if, in addition, the correspondence arising from the accounts were made over to the accountant. There would be a considerable saving of labour on the part of the Executive Engineer, who would thus have considerably more time at his disposal to spend on the actual work of engineering.

421. The average working day of an Executive Engineer in the Irrigation Branch depended on the amount of inspection he had to do, which varied from district to district. It averaged probably eight or nine hours.

422. (*Mr. Mackenzie.*) He did not think it necessary for the Executive Engineer to spend certain specified days at headquarters every month because of his accounts. They did however undoubtedly increase correspondence.

423. The Public Works Department Code required revision from beginning to end. It was too large, and the frequency with which standing orders were issued made it impossible for anyone to be sure exactly how the rules stood. The Code should be re-published more frequently, and the issue of correction slips to cover every possible contingency should be abandoned.

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Mr. F. St. J. GEBBIE.

[Continued.]

424. (*Rai Bahadur Ganga Ram.*) He was in favour of the proposal that the architect should be made responsible for the construction as well as for the design of his buildings. It would, however, be necessary to select the architect carefully before placing him in so responsible a charge. In the particular case cited in his written evidence, the faulty construction was entirely due to lack of supervision over the contractor's work; the ordinary contractor really required much more supervision than he actually got. He had not gone into the matter, but he believed that architect's charges were 7½ per cent. including supervision. The building he had referred to was built for a Calcutta firm but the architect was a Karachi man.

425. There was no separate Buildings and Roads Branch in Sind, all buildings being under the Irrigation Branch. He had no idea as to how the establishment charges were divided up, but this was probably done by the Accountant-General.

426. He had some men serving under him who came from the Poona College of Engineering, but very few who came from Roorkee. It was difficult to compare the men

from the Poona College with those from Roorkee, as the men who came to Sind from the latter college were military men, *i.e.*, sub-conductors, etc.

427. (*Mr. Cobb.*) The college in Sind supplied him with subordinates who, he thought, were sufficiently qualified and who were younger, as a rule, than those obtained from other colleges. They had passed through the engineering branch attached to the Arts college, and the teaching in this engineering branch was fairly satisfactory. He would, however, prefer to take men with a little more practical experience, and would make it a condition that such men should have taken a course of practical training on leaving college extending over six months at least or preferably a year, in order to enable them to acquire some experience in the management of labour.

428. (*Mr. Kent.*) He would support the proposal that an Executive Engineer should have in his office an accounts officer of superior rank, though not necessarily of the standing of an Assistant Engineer. Anything which would take the accounts' work from the hands of the Executive Engineer would be welcome.

H. D. GILL, Esq., Partner, Messrs. Richardson and Cruddas, Bombay.

Written Statement.

429. (I.) Economy and suitability of methods of execution of public works, and (II) Encouragement of other agency.—Speaking as representing the Bombay Chamber of Commerce, and from my own experience as a manufacturing engineer in this country, I consider that the working of the Public Works Department is, on the whole, satisfactory, and that while there are directions in which private enterprise can and should be encouraged, no drastic changes are necessary.

(2). As regards earthwork, building and masonry work, I think that, generally speaking, the present system of doing such work departmentally, or through petty contractors under close departmental supervision, is probably the best and most economical under the conditions which obtain at any rate on this side of India. With few exceptions, these works are not of such magnitude as to be worth the attention of the large contractor with his expensive plant and machinery. The methods of the ordinary Indian building contractor are no doubt capable of much improvement, especially in a city like Bombay, but, where low cost rather than expeditious construction is the first consideration, existing methods are not so easily beaten as may appear at first sight.

(3). In the case of iron and steel work, the manufacture of this requires a works equipped with suitable plant and machinery, and such engineering works are in the main already run by private enterprise. In some cases the erection of the finished iron or steel work at site is done departmentally, and in others by the manufacturer or another contractor as circumstances may appear to dictate, and I do not think this can be much improved upon.

430. (V.) Decentralization.—The chief direction in which private engineering enterprise can be encouraged is by relaxation of the present rules relating to the local purchase of engineering stores and materials and, con-

sidering the importance of having in this country ample stocks of these things as well as a flourishing engineering industry, not only to meet the pressing military requirements in times like the present, when shipping facilities are becoming more and more restricted, but also in times of peace, for the development of the vast agricultural and mineral wealth of the country, I submit that any measures having these objects in view merit the serious attention of government. This, however, and the safeguards necessary in order to protect British imperial interests are perhaps matters which more strictly come within the scope of the Indian Industrial Commission now sitting.

431. (VII.) Education.—I have little or no direct knowledge as to the system of education in the government engineering colleges of this country and am, therefore, not able to offer intelligent criticism on their curricula and methods. It cannot be too strongly emphasized, however, that book learning is only a part and, perhaps I should add, only a small part, of what goes to make a capable engineer. Engineering, much as it depends on correct theoretical knowledge, is not by any means the exact science which many suppose, and it is only in the hard school of practical training and experience that the necessary confidence and judgment can be acquired to successfully apply theoretical knowledge. There are also other qualities such as initiative, ability to accept responsibility, leadership, etc., and I fear that my experience with the product of the government engineering colleges, limited though it is, is such that, judged by these standards, the result, with few exceptions, is disappointing. In course of time, as engineering becomes a larger and more flourishing indigenous industry, the present prejudice amongst certain classes against manual work and false notions as to the indignity of labour may disappear, but for the present this places a serious disability on indigenous talent.

Mr. H. D. GILL called and examined.

432. (*President.*) The witness stated that he was a partner in the firm of Messrs. Richardson and Cruddas. The firm was mainly employed in the execution of structural steel and iron-work, but various kinds of work were undertaken by it, on behalf of government, in connection with irrigation, building and railway projects. The staff employed by the firm were specialists in steel and iron-work.

433. All the head officials of the firm were Europeans, even down to the foremen, and in addition, three Eurasians were employed in responsible posts. As regards Indians, they were engaged only in subordinate positions, as *mistri*. The reason why a firm of so long standing in India as Messrs. Richardson and Cruddas had no Indians

holding posts of responsibility was because suitable men had not been found; had they been able to obtain sufficiently skilled agency amongst Indians, they would have welcomed their employment, as they were anxious to see Indians on their staff and holding good posts. They had made efforts in that direction but had not been successful.

434. The firm had not had very much experience of the youths turned out from the Poona College of Science. Some students had come to them for a few months' practical training but were paid nothing. The general experience of the firm in regard to these students was that they lacked application, and if any work was wanted from them they generally fell sick. They did not appear

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[Continued.]

to be really anxious to do any practical work. The firm had never tested the theoretical training of these students. They had, however, had some experience of the output of the Victoria Jubilee Technical Institute in Bombay and had found these men to be of much the same type as those from the Poona College. They did not show themselves capable of undertaking responsible work, and the firm did not find them much superior to the ordinary workmen employed, who came as boys, starting on four annas a day, and worked their way up at the trade.

435. The witness appeared before the Committee as a representative of the Bombay Chamber of Commerce. In regard to the expansion of private industry, as opposed to the present departmental system for the execution of works, the general views of the Chamber of Commerce were that private enterprise should be encouraged by all possible and reasonable means, but that it would be a mistake to make any sudden or drastic change. He was of opinion that one of the directions in which change should be effected in the present system, in order to give encouragement to private enterprise, was the relaxation of the rules relating to the local purchase of stores. He thought that private enterprise should be encouraged rather by developing existing firms than by creating new ones. He went on to say that Rule 1 of Appendix 30, Public Works Department Code, which related to the purchase of articles manufactured in India from Indian materials read quite satisfactorily, but he thought that Rule 8 nullified it to some extent. This rule, he suggested, was an inducement to officers to err on the safe side, and to send an indent through the Secretary of State for materials, which they were, in reality, authorized to purchase locally if they exercised their powers. As regards Rule 2, he considered that if imported articles could be supplied by firms in India at the same rate as that at which they were imported through the Stores Department, they should be purchased locally, a procedure which would give such firms as his own an opportunity of stating whether they could produce such articles. This system, he added, would, if enforced for some time, encourage local manufacture. As regards Rule 3, he advocated that, although an Indian firm might not have a particular article in stock, yet if they could quote cheaper rates than the Stores Department in England, the article should be ordered from the Indian firm. He believed that this system worked satisfactorily in the case of large municipalities, e.g., Bombay, which had adopted it. He considered that the local purchase of stores was the main item in regard to which the Public Works Department could do more to encourage private enterprise.

436. In connection with the criticism on the Public Works Department that it did not encourage, as much as it might, the use of indigenous materials, as for example lime and cement, he had not noticed any tendency of this sort. It was, however, a subject on which he was not competent to speak. His firm was mainly concerned with iron and steel. They had used Bengal pig-iron for many years and accepted the steel turned out by the Tata Iron Works so long as it came up to the British standard specification. He could not say whether there was any tendency on the part of the Public Works Department to adhere too rigidly to the use of imported materials. His firm had a large experience of Public Works Department contracts in connection with steel and iron-work, which was not confined merely to the supply of materials but extended to the construction of bridges and other structural work. Some of the bridges supplied by them were erected by the Public Works Department and others by his firm. With the exception of the local purchase of stores he had no suggestions to make as to improving and encouraging private enterprise, and thought that the Public Works Department had given sufficient scope to private enterprise in other respects.

437. He had no information to give on behalf of the Bombay Chamber of Commerce regarding building contractors in Bombay, and this question had never been discussed by the Chamber as no building contractors were represented on that body.

438. (*Mr. Cobb.*) Students came to his firm presumably in order to acquire a practical knowledge of the manufacture of iron and steel-work, and an acquaintance with works in general. With the consent of the firm the foreman was only too glad to help such students to gain practical knowledge if the latter desired it. These students usually stayed only a few months with the firm. They were supposed to do the tasks of workmen, to which, however, they seldom took seriously. Such students did not receive any salary while with his firm, although regular apprentices were paid.

439. (*Rai Bahadur Ganga Ram.*) He would not advocate the transfer of the Director General of Stores to India all at once, as he considered that there was a possibility that such a move might prove a failure. It was rather a big question and he was not prepared to say that all his difficulties would be removed if the Director General of Stores' office were located in India.

440. When the Public Works Department ordered iron and steel materials for a bridge they sometimes asked the firm to undertake the construction of it as well, in which case it was carried out by the firm's own staff. It depended on circumstances what percentage his firm allowed for the employment of extra staff on the erection of a work. They employed their own men, and regulated the staff to be sent out according to the magnitude of the work. For instance, if a large bridge were to be constructed, they would send one of their European foremen, the percentage of whose salary to be charged to the work would be calculated on the number of months actually spent on the erection. Smaller contracts were frequently put in the charge of a competent Indian *mistri*.

441. He thought his firm would be willing to take five students for practical training, and give them current wages. He explained that the ordinary *chokras* employed by his firm started on four annas a day, and worked up to eight annas and a rupee as they got older. There was also a class of apprentices in his firm who were educated men, and started on eight annas a day. His firm did not pay anything to the students who came for a few weeks only to acquire practical knowledge.

442. (*Mr. Mackenzie.*) He was not in a position to say where the Director General of Stores would have to be located were he transferred from London to India. He thought there would be difficulty in effecting this transfer.

443. He did not think it would be a feasible scheme for a local Government, e.g., the Government of Bombay, to have a 'buyer' for the purchase of stores, who would not be an official but a business man and who would obtain tenders, lay them before the local Government for selection, obtain the goods, do the testing, make the payments, and receive a commission from the local Government, because an Executive Engineer would much prefer to place his orders direct as he knew best what he wanted. He foresaw difficulties in adopting this system of a 'buyer,' and thought that the whole question was a matter for the Public Works Department themselves to decide, as it involved internal organization. He considered, however, that plenty of firms could be found who would be willing to take up the post of "buyer," though, from an industrial point of view, it would not be desirable to empower this 'buyer' to purchase stores from England. There were several firms in India similar to his own, which were confined to India and were not branches of a firm in England. It was necessary to keep in close touch with home manufacturers as many articles, such as engines, could not be obtained in India and hence had to be imported, although he thought that they would, in course of time, be made in India. He thought that, if one firm were appointed as 'buyer,' other firms would express dissatisfaction, and that this 'buyer' would have to give up private practice and be a government official rather than a whole-time man engaged for the purpose. Such a man, being a government official, would be liable to get into a groove, and the amount of work which would have to be done would eventually require a whole department rather than a single man to cope with it, as was now the practice on railways where there were store-keepers and a regular stores department.

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444. (*Sir Noel Kershaw.*) He recollected that, during the construction of a bridge by his firm for the Public Works Department, the Executive Engineer had supervised the work, but he was not able to say whether the Superintending Engineer also came to inspect it. He added that it was usual for the Public Works Department to have a subordinate constantly on the spot to supervise construction, and in the particular case he had in mind, the subordinate was probably an upper subordinate.

445. (*President.*) As to the comparative efficiency of the Indian staff of his firm with the staff employed by a firm of similar size in England, he stated that the output of the Indian staff was considerably less—about one-third of the output of the corresponding staff in England. He added, however, that this output varied and was not

so widely different in the case of machine-made work as it was in that of work executed by physical and manual labour.

446. (*Rai Bahadur Ganga Ram.*) The witness stated that he was aware of many instances where structural works, which could have been executed by firms in India, had been given to firms in England, and instanced the case of a bridge for the erection of which his firm had not been allowed to tender. This bridge was similar to one his firm had recently erected at Kalyan. His firm got a certain amount of railway works to construct. He explained that railways indented through their own boards in England for what they wanted, employing consulting engineers at home for this purpose. As stated, however, his firm was occasionally called upon to take up work for railways.

W. E. COPLESTON, Esq., Divisional Forest Officer, North Thana.

Written Statement.

447. (I.) *Economy and suitability of methods of execution of public works.*—As regards the upkeep of roads, roadside trees and all ordinary repairs not requiring engineering skill the methods employed are neither economical nor suitable.

448. (II.) *Encouragement of other agency.*—In all the more unhealthy and remote parts of the Konkan the upkeep of roads which are generally speaking only used by country carts chiefly for carriage of forest material and grain should be carried out by contractors working under the control of the Collector of the district. Local contractors are in a position to carry out road repairs more economically than any government department can and the Collector has more efficient means of control than any other officer. As there are in forest districts many reliable men who are accustomed to carry out government contracts during the fair season in the government forests, there should be no lack of competition.

(2). Their cart work in the forests ceases from June 1st, and does not recommence till October or November. They keep large numbers of well-trained teams of buffaloes and bullocks which could well do rolling work and carting of metal during the rainy season.

(3). The contractors themselves are personally interested in the upkeep of the roads. Many of them are well-to-do land-owners and they command labour throughout the year in the villages through which the roads pass. In some parts the forest contractors have almost complete control of all local labour, with the result that the Public Works Department subordinates find it very difficult to get their ordinary annual road repairs done at the proper time, consequently delay occurs, dry weather sets in, the work is scamped and hurried and in spite of ample allotments the roads are in a chronic state of disrepair.

(4). This lack of command of labour leads the Public Works Department subordinates to push up the rates in order to attract labour and in many cases they accept bad material, especially road metal. In Kanara, though the Public Works Department rates for metal are usually one to two rupees per 100 c. ft. higher than those paid by other departments, the metal is on the whole rather inferior in quality, and in parts of Thana, where the Public Works Department are paying Rs. 5 per 100 c. ft., the rate paid by the local contractor, that is the wages received by the villagers who actually do the work, is about half this sum.

(5). The government subordinate, whether Public Works Department, Forest Department or of any other government service, is usually a man who never has been a workman himself, consequently he never really realises what good economical workmanship means. In European countries this class of work is under the direct control of a man who has risen from the working class, in this country the Public Works Department overseer or range forest officer belongs to a class which looks down upon manual labour.

(6). As an extreme instance of what this may mean I quote a case which came to my notice recently. A

range forest officer was ordered to fence an area for a plantation. He was of many years' service and consequently more experienced than the average man. On one side no fence was required but the range forest officer did not realise this latter fact. He drew up an estimate of Rs. 169 per acre, assuming that an area of one acre would require roughly 70×4 yards = 280 yards of fencing, the side of a square of one acre equalling approximately 70 yards. When carrying out the work he put down twice as many yards of fencing as was actually needed. Further he used six 10 ft. teak posts where only one 6 ft. post was required, also he used five strands of barbed wire where three sufficed. Consequently, the quantity of teak posts actually used was 6×10 ft. where 6 ft. only were needed, and the quantity of barbed wire was 10 yards where only 3 yards were required. By the time he had fenced in 8 acres he had used up all the available material. When the divisional officer came to inspect the work he had to have it all taken up and was able to fence the 40 acres efficiently with the material which the ranger had used for 8 acres, that is to say the cost of fencing was reduced by $\frac{4}{5}$ ths, and as a matter of fact the actual expenditure per acre worked out to about 15 rupees less than $\frac{1}{10}$ th the ranger's estimate. It is difficult for any one accustomed to European work to realise the extraordinary bungle intelligent well-educated men in this country can make of a very simple job.

(7). To avoid such blundering, the supervision of all simple works such as road repairs should be placed more in the hands of the working class of man, and to bring this about it is strongly recommended that (a) the upkeep of roads be given out on contract, (b) the work be placed under the control of the Collector of the district, (c) the Executive Engineer be made assistant to the Collector as far as these contracts are concerned, and that he should inspect the road and pass a certificate of completion of the contract upon which the Collector will pay the contractor direct. *The subordinate Public Works Department service should have nothing whatever to do with the upkeep of roads given on contract.* After years of departmental forest works in Kanara one learns that the average government subordinate is a clog in the machinery, and that a practical contractor working directly under the control of an imperial officer in whom he has confidence, and working in competition against other contractors, can execute work efficiently and economically where the government official would fail.

(8). It is quite probable that the Public Works Department may raise objections to the Executive Engineer being placed as assistant under the Collector. At the same time the divisional forest officer both in the Madras Presidency and in this presidency is regarded as an assistant to the Collector in all except purely technical matters.

(9). Some step is required to decentralize the present system of Public Works Department work in the matter of roads. At present they have their own Secretariat, and in matters in which undoubtedly the district officers ought to be able to use their influence even the Collector

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cannot easily introduce local improvements in the methods employed.

(10). The Forest Department certainly finds the Public Works Department difficult to approach and we have to look on and see government money wasted. This is wrong, we are all officers of one government and any government officer ought to be in a position to put a stop to any obvious waste. To quote a local example, at Manor and Kase in North Thana range offices and rangers' quarters were constructed by the Public Works Department. The sum expended on these was roughly 8,000 rupees apiece. Although these buildings are situated in the midst of extensive government forests, where teak of good quality is abundant, the timber used in the buildings was jarrah wood from Australia! Teak was locally available at a cheaper rate than jarrah. It is a far superior timber for the purpose, but when the divisional forest officer objected to the use of Australian wood, he was told that the estimates had been drawn up for jarrah wood and it was too late to alter them.

(11). The Public Works Department are at present constructing a ranger's quarters at Harsul in Peint, Nasik District. The estimate which the Executive Engineer kindly lent to me is Rs. 9,600. Compare this with the actual cost of the following six buildings for rangers' quarters and offices in the northern division of Kanara constructed by the Forest Department, who of course show no charge for timber and have many local facilities such as their own saw-mills and so on.

	Rs.
Dandeli range officers' quarters and office	1,355
Bomanhalli do.	1,355
Virnoli do.	1,355
Kulgi do.	1,200
Gund do.	1,500
Supa do.	1,000
- Total	7,765
Average	1,294

The above buildings in Kanara would have cost at least two or three times their actual cost had they been handed over to the Public Works Department.

(12). One reason for the high rates in the Public Works Department works is the system of estimate. To ensure getting the work done the Public Works Department subordinate establishment place the estimates as high as possible, and in many cases the subordinates think more about getting through their allotments than they do of economy in their work. Where such large sums are expended, this system by which the people who frame the estimates are the people who spend the money seems wrong, hence the proposal to put the upkeep of roads in the hands of the Collector who not only has far more influence in the district than the Executive Engineer

but has officers all over the district under him ready to bring to his attention the condition of the roads and any deficiencies in the method of their upkeep. Unfortunately in this country officers of the subordinate establishments of government departments are placed in a difficult position owing to the *custom* among native contractors to try and get round them by bribery. This is an additional reason for the proposed change.

(13). Another matter which requires looking to in the heavy monsoon zone of this presidency is the cultivation of roadside trees. Where a good rainfall is assured nothing could be easier than to grow roadside trees. Yet, in districts where trees such as species of *ficus* and the mango grow as weeds in the forest and really require no attendance and no watering, one sees elaborate arrangements and much unnecessary labour expended by the Public Works Department. The results are astonishingly poor. Many of the seedlings are over-watered, practically all are exposed to damage by cattle, the tree guards are such that cattle in the hot weather are tempted to nibble off the tender green shoots. The plants are often put out after the monsoon in October and November instead of in June and July. Species which as seedlings naturally only grow in the dense evergreen forests are given no shade. They are rarely if ever soil-mulched at the right time of year. Now almost any local villager, if he so wished, could make a much better effort to raise these trees than the Public Works Department subordinate. As it is, the *coolie* is ordered to carry out the work in accordance with the ideas of the Public Works Department subordinate and he does so.

449. (III.) Changes in organization.—In many cases the temptations placed before low paid subordinates are such that the authority, that is, government, is morally wrong in placing men of low pay in the positions we frequently find them and some effort should be made to rectify this. The upkeep of many roads should be entirely removed from the subordinate establishment and for this purpose some modification in the staff is necessary.

450. (IV.) Relations with other departments and sub-branches.—It does not meet the needs of other departments which require their works to be carried out economically. The result is officers of other government departments, e.g., Salt and Abkari, Forests, have to spend much time on building and road works, which in reality are not part of their duty and for which they have received little or no training.

451. (V.) Decentralization.—Decentralization is necessary as indicated above, and, as far as ordinary road repairs and works not needing the skill of an engineer are concerned, the Executive engineer should be assistant to the Collector just as the divisional forest officer is in matters not requiring special technical training.

MR. W. E. COPLESTON called and examined.

452. (President.) The witness stated that he was a member of the Forest Service, and that he had served for practically 20 years in the Kanara district, which was a thickly wooded and thinly populated tract. There were five forest officers in the district, who managed between them three thousand square miles of government forest. He admitted that it was not a typical district.

453. The suggestion in his written evidence that the maintenance of roads should be taken out of the jurisdiction of the Public Works Department and made over to the Collector, with a view to their being kept in repair by contractors, applied to the less important metalled roads—roads surfaced with laterite, and unmetalled tracts. Under this system the Collector, who would receive reports from all the district officers regarding the state of these roads, would have more efficient control over their maintenance than the Public Works Department had at present. Although a district officer might have no engineering qualifications, he could report on the state of the metalling of an ordinary surface road. The district staff were as much interested in the upkeep of these roads

as the ordinary public were. He admitted, however, that control in the matter of bridges could not be given to the Collector in this way. He did not know how far it was the case that the system advocated by him was the same as the present system, under which the Collector is the chairman of a district board and is responsible for the maintenance of certain provincial and district roads, but he believed that in some cases roads were in the charge of local boards. He was of opinion that it would be more economical for district boards with the Collector as president to maintain the roads, but could not say whether the work would be more efficiently executed by such agency than by the Public Works Department. Some of the forest roads were metalled and the divisional officer, with his staff, supervised their construction. He knew of only one road, about fifteen miles long, which, although so constructed, had been handed over by the Forest Department to the Public Works Department on account of the heavy traffic that passed along it. He explained that usually the Forest Department began by making a rough road sufficient for their own purpose and then handed it over to the Public Works Depart-

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[Continued.]

ment when the amount of traffic that passed along it converted it into an important road. This, however, was not the class of road which he suggested should be handed over to the Collector. Only what might be called third-class roads on which there was really no important traffic, such as government tracks, forest tracks and so on, should be made over to the Collector.

454. It was left to the option of the Forest Department to decide whether they would maintain the roads they constructed or hand them over to the Public Works Department. He admitted that the tendency of the Forest Department at present was to divest themselves of the responsibility of maintaining these roads by making them over to the Public Works Department.

455. Owing to the Collector's influence with village officials, even in thinly populated tracts, he thought that that officer would have a better chance than the Public Works Department had of securing the labour required for the maintenance of unimportant roads. By "influence" he did not mean that the Collector would exercise any undue influence in securing the supply of labour, but people looked to him as their natural protector and all complaints were made direct to him. The supply of labour, etc., for forest work was provided by contractors. Such men were always available during the monsoon, and it would be a good thing if they took work under the Public Works Department during that season, as they alone had control of the local labour and hence would find no difficulty in supplying it. He explained that it would be very easy for the Collector as head of the district to induce contractors to take work as he could use pressure if necessary. He considered that there were many reasons why contractors liked to do work for the Collector. That officer was the district magistrate, head of the revenue establishment, etc., and contractors are more ready to do things for him than for anybody else in the district. Though this officer was in a position to use any amount of pressure, he did not anticipate that he would do so in practice.

456. His experience in Kanara district was that the Forest Department was able to construct metalled roads much cheaper than the Public Works Department. He had compared the rates paid by the Public Works Department and by the Forest Department and had found that the latter were the cheaper. For instance, in Kanara, if the Public Works Department rate for road metal was Rs. 6 per hundred cubic feet, the Forest Department could probably supply similar material for Rs. 4-8. The rates, of course, depended on the distance of the quarries, and the rate he referred to was for the metal in site on the road. For the same lead in both cases the Forest Department got metal at a cheaper rate than the Public Works Department because they had more influence with the contractors.

457. Forest officials had practically no training in engineering; even the men who were trained in the college at Dehra Dun received very little training in that subject. He explained that the object of his proposal was not to oust the Public Works Department altogether, but to make the Executive Engineer an assistant to the Collector and thus place him in the same position as a forest officer, i.e., subject to the control of the Collector except in purely technical matters in which he would exercise an entirely free hand.

458. The principles of road making were usually understood even by the coolies or mukadamas themselves, and it did not require a trained engineer to metal a road. He thought that the construction and maintenance of roads could safely be entrusted to contractors without expert supervision. The Executive Engineer would see whether the work was done properly or not, and the Collector would make the payments. This last was essential as otherwise he would have no control over the works. There was a general complaint among the people and private contractors that the officers who framed the estimates had control over the works and over the disbursement of the funds.

459. The rates were at present settled by the Executive Engineer, but the subordinate establishment was always

pressing for higher rates. The fact was that government could not get the work done at the same rate as the contractors could.

460. The fact that the Collector was the head of the district would not keep down the rates. This could only be done by competition among the contractors themselves. Under the system at present adopted by the Public Works Department the work was often not done by contractors at all but by men who were working under the Department, which fact constituted the reason why wealthy and influential men in the forest districts would not touch Public Works Department work. He suggested that contracts for long lengths of roads should be given out to big contractors.

461. The Forest Department in North Thana had not constructed any quarters for their range officers, indeed there was very little money spent on building work either by the Forest Department itself or by the Public Works Department on their behalf, the amount of such work being extraordinarily limited. There were at present in North Thana three rangers' quarters built by the Public Works Department, but he could not say why the work had been given over to them, but probably the Forest Department had no trained men, and hence had asked them to undertake the buildings. He believed that a forest officer signed the plans and estimate for every work undertaken by the Public Works Department on behalf of the Forest Department, but the district forest officer had no control over such works. The witness did not himself sign the plans and estimates prepared by the Public Works Department for the construction of rangers' quarters, as these were sent to the Conservator. The Public Works Department had standard plans for such quarters which were approved by the Conservator of Forests. With reference to the comparison made in his written evidence between certain quarters built by the Public Works Department and those built by the Forest Department, he admitted that it was possible that in some cases the work done by the Forest Department did not come up to the standard required by the Public Works Department. He was, however, of opinion that the Forest Department should construct their own buildings.

462. He did not know whether, at any time, arboriculture on roads in the Bombay Presidency had been in the hands of the Forest Department, nor had he heard that this system had been tried in certain divisions but had failed badly. These roads, as far as he knew, had always been in the hands of the Public Works Department.

463. His central idea was that the Executive Engineer should be an assistant to the Collector in the same position as the forest officer. The advantages that would accrue from this would be that the Collector would be able to give more assistance in regard to the supply of labour than he could under the present system. He had a much greater control over labour than any one else, since he could call upon his executive officers for assistance. There was, at present, a lack of co-operation between the different departments. There was one Executive Engineer in each district and the Executive Engineer's division was coterminous with that of the civil district. He had no experience of one Executive Engineer being in charge of two districts, but if there were such cases he admitted that the adoption of his system would be somewhat more difficult.

464. (Mr. Cobb.) He could not say why the construction of certain rangers' quarters mentioned in his written evidence had been made over to the Public Works Department, nor why an estimate for Rs. 8,000 had been sanctioned, when the average cost at which they could have been constructed by the Forest Department was only Rs. 1,294. The particular work referred to was constructed in another circle, and it was possible that the Forest Department had no qualified ranger to undertake such work.

465. (Rai Bahadur Ganga Ram.) Even if the Forest Department were allowed 5 per cent. for establishment, the question of its undertaking a certain work itself would depend upon whether the Department had competent staff or not. At present they did not charge anything for

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[Continued.]

establishment, but they would be quite willing to accept a percentage for such charges and do the work themselves if they had the necessary qualified staff available. The witness could not say whether the rate of 5 per cent. would enable the Department to undertake all its own works. This was only an average rate and the actual rate would vary according to the distance from the quarries, etc.

466. The estimate for Rs. 9,600 referred to in his written statement as submitted by the Public Works Department for the construction of a ranger's quarters probably included the cost of timber. He considered that the difference between the Forest Department estimate and the Public Works Department estimate would not have been reduced to any great extent, even if the cost of timber had been included in the Forest Department estimate.

467. The Executive Engineer should be made an assistant to the Collector, not because the latter would then make the payments but because of the large number of roads in the districts and of the fact that the Collector, as head of the district, was more concerned in the upkeep of these roads than anybody else. He thought that this would conduce to economy and efficiency. He did not know of any case in which an Executive Engineer was in charge of two or three districts. He did not wish to imply that the Collector had not already sufficient work, nor did he desire to add thereto; he had made his suggestion purely in the interests of economy and efficiency.

468. The Forest Department did not charge anything for the timber utilized for the construction of quarters and other purposes. That was the practice, though the witness could not say whether it was according to the Code or not. The amount of timber used was written off by the Conservator in the timber returns, but no money value was placed opposite the entry denoting the timber utilized.

469. (*Mr. Mackenzie.*) The forest officer was an assistant to the Collector in regard to such matters as grazing, supply of fuel to the villages, etc., and he admitted that under the system which he proposed the Executive Engineer's work would be in no way parallel. It was only in the interests of efficiency that he had proposed to make the Executive Engineer an assistant to the Collector.

470. He could not say what would have happened to the Executive Engineer referred to in his written evidence, who had insisted on using jarrah wood because it had been entered in the estimates although good teak wood was available in the forest at a much cheaper rate, if the matter had been reported to the Chief Engineer. He admitted that it was not a typical case, but an exceptional one.

471. A forest officer could not give any instructions about road-side avenues unless he were asked to do so. It was a matter in which the forest officer could render considerable assistance to the Executive Engineer, but he had not known a single instance in which a district Executive Engineer had gone to the forest officer for advice in such matters.

472. The rainfall in Kanara varied from 30 to 200 inches and during the monsoon it was difficult to do road repairs. These were generally held over till September, but one could work on the eastern side of the Kanara district in June, though even there the state of the roads adversely effected progress. The soil in the Kanara district varied. There was a lot of laterite while on the higher hills there was granite and in the east black cotton soil. The witness considered that the metal broken by the Forest Department was as good as that broken by the Public Works Department. A forest officer had great advantage in the matter of obtaining labour and had control over labour and carts, etc. Owing to his being assistant to the Collector, he could get considerable assistance from the *mamaltadars*.

473. (*Sir Noel Kershaw.*) He had made no report to the Executive Engineer when he had found that the seedlings on the roads were not planted either in the proper places or at the proper season, as the departments did not co-

operate. That was why he wished the Executive Engineer to be under the Collector. He instanced the case of a forest officer who asked the Public Works engineer for the loan of two rollers. The latter replied that they were required and that he could not have them, although as a matter of fact the rollers were not moved for a considerable time. The matter was not reported, as the Public Works Department was not under the Collector. There was no officer to whom such complaints could be made a fact which, he considered, constituted a defect in the administration. The witness suggested that there should be some such officer, and repeated his statement that the departments did not co-operate at all.

474. He was of opinion that the people had learnt to look after roads and that it did not require a trained engineer to lay metal and keep roads in repair, and hence he had suggested that the roads should be handed over to the Collector.

475. (*Mr. Kent.*) If the Public Works subordinate staff were abolished the procedure that the witness would suggest might be somewhat on the following lines. The Executive Engineer of the district would draw up a contract for the construction of a road, and would call for tenders and allot the work to a contractor. The contractor would complete the work without any supervision at all. After completion the Executive Engineer would inspect it, check it with the estimates and report to the Collector that the work had been properly done. The Collector would then proceed to pay the bill. The witness added that this would be possible in practice, and that there would be no necessity for anybody to act between the Executive Engineer and the contractor. In the Forest Department the officers had worked direct with the contractors, and not let the rangers or any other subordinates have any dealings with them. He thought that contractors could be found who would carry out work properly and that the Executive Engineer would be able conscientiously to certify that it had been properly done, although he had not supervised it from start to finish. In certain districts at any rate contractors could be found who would carry out work efficiently and economically without constant supervision.

476. With reference to the suggestion in his written evidence that road repairs should be made over to the working class of man, he explained that contractors now-a-days employed men of the working class who acted as head *mukadam* and who could bring their own men and do work without supervision on the part of the contractor. The contractor only made the payments. In some districts one could get excellent men, to whom lengths of roads might be made over and who would do it properly, some of them having already done work under the Public Works Department. The witness considered that such work could be left entirely to these men. He admitted that they had received their training in the Public Works Department, but considered that they were more efficient in the supervision of work than were the subordinates employed by the Public Works Department. This working class of men, whose employment he advocated, were men who had constructed roads themselves, while in the case of the Public Works Department the man in charge was usually one who had never even mended a road himself.

477. The witness thought that if the Executive Engineer were assistant to the Collector it would obviate the complaint of the Public Works Department that sufficient facilities did not exist for obtaining timber direct from the Forest Department. He admitted that there had been cases in which the Public Works Department had asked for timber from the Forest Department and had been told to get it direct from the forest contractors. Personally, he would like such a procedure stopped. He thought that the suggestion that the Forest Department should send monthly or quarterly statements of timber available to the Public Works Department would be feasible in practice, but added that there were different systems followed for the sale of timber, and that in his own division for example the whole of the timber was sold in August.

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[Continued.]

E. G. TURNER, ESQ., I.C.S., Collector of Dharwar.

Written Statement.

478. (I.) *Economy and suitability of methods of execution of public works.*—There is certainly an impression abroad that works executed by the Public Works Department are expensive, and the impression seems to be so general that one might be pardoned in thinking there may be some truth in it. The impression seems to have reference more to the construction of buildings than of roads, presumably because so many people build houses whilst so few ever construct roads. In discussing this question with unofficial Indian gentlemen, they generally compare the rates paid for their own houses, or for buildings in which they are interested, with rates paid by the Public Works Department. Not being engineers, their opinion as to the quality of the work in each case is, however, not of much value and it is therefore possible that the higher rates paid by the Department results in a more durable structure being erected and in a greater expenditure on upkeep which more than compensate for a greater initial outlay. Where building contractors are available, the method of the Public Works Department appears to be thoroughly sound, at least in theory. An estimate is prepared and tenders invited, and if no contractor is willing to undertake the work within the amount of the estimate, the work is carried out departmentally. It is possible that a contractor demands higher rates from the Public Works Department, because of the number of officials whom he has to satisfy that his work is being properly done, and because of the strong position of the Department should dispute arise during the progress of the work. Railways are in a position similar to government and the supervision by their engineering staff is as thorough and irksome as supervision by the Public Works Department, yet their contracts are not unpopular, because their rates are higher. In my opinion economy and efficiency depend more upon the quality of supervision than its quantity. Constant inspection and direct supervision by reliable officers is preferable to supervision through subordinates. In this respect an owner supervising the building of his own house has an advantage, as he is constantly, perhaps once or twice daily, inspecting the progress of his building, he settles differences promptly and gets the work completed as soon as possible, all of which is an advantage to his contractor. Where qualified contractors are scarce, more work must be done departmentally and the work of supervision in consequence increases. More supervising officers of the right stamp and more touring on the part of the higher officials is in consequence demanded. The question of direct supervision by reliable officers is no doubt fully appreciated by the Public Works Department, but I should like to quote actual examples from my own experience. Whilst in charge of the Salsette Development Scheme, I had the advantage of the assistance of an Executive Engineer. The actual works executed under his direction were not numerous, and he was personally able to supervise them constantly. The rates paid compared favourably with the rates paid by others and the works were carried out with commendable promptitude. The contractor admitted to me subsequently that his favourable rates were due to the certainty of his getting his money, and to the fact that the only person he had to satisfy about his work was an officer whom he could trust to treat him fairly in case of difficulties arising, and who would not give him unnecessary trouble whilst the works were in progress. I think this example supports the contention that economy is secured by direct and constant supervision of superior officers. Executive Engineers should be constantly on the move inspecting works in progress and in these days of motor cars and railways frequent tours from headquarters seem to be more desirable than prolonged tours with cartloads of personal and office kit. Frequent transfers of officers also in my opinion affect current rates especially as regards the supply of road metal. Advantage is taken of a change in personnel to raise the rates and form combines. An officer well acquainted with his charge is able to check

rates from his own personal experience and inquiries and is in a better position to break up "rings" which contractors sometimes form.

479. (II.) *Encouragement of other agency.*—Private enterprise is at present encouraged by the system of calling for tenders and as far as my knowledge extends Executive Engineers prefer works being done by contract to departmental agency. It saves them trouble and much accounts work. It seems however to be the general cry that reliable contractors are not easy to obtain. If the difficulty is not due to any preference of the Department to do work departmentally, then it must be due to the unwillingness of contractors to accept Public Works Department contracts. I have discussed the matter at length with the leading contractor of the Dharwar district, who has taken Public Works Department and railway contracts, and I requested him to give me his candid opinion why Public Works Department contracts were unpopular, and he replied that it was due mainly to the annoyance that could be caused by subordinate supervising officers. He seemed especially keen on improving the status of the works *mistris*, and declared that matters would improve considerably if *mistris* were more reliable and suggested that much could be effected by employing as *mistris* permanent government servants. Contractors even in a wealthy district like Dharwar are scarce, few are able to read plans and none of them are qualified engineers. The majority of them are small men, illiterate and capable only of doing petty works, contracts such as supplying metal and picking roads. To encourage the smaller contractors, I think that advances might be allowed before a work is started so as to do away with the intermediate *sowcar*. The grouping together of works might also be encouraged so as to attract contractors of higher standing, e.g., contracts might be given for the maintenance of all buildings within a given area, or for the repair of certain lengths of roads. Petty contracts for small portions of roads have no attraction to any but the very small men, but if the upkeep of fairly long portions of road, say thirty miles in length, were given on contract it might encourage the creation of a better class of contractors who would depend largely upon the Public Works Department for their livelihood and in consequence have every inducement to do reliable work and have some pride in keeping their good name. I am informed that this system of giving out lengths of road on contract for annual repairs is followed successfully in the Mysore State. As regards the construction and upkeep of public works by agencies other than the Public Works Department, I can only suggest further powers being given to local boards as they improve their own engineering establishment. If a local board creates a Public Works Department of its own with a qualified engineer at its head, it could be safely entrusted with all its own buildings and roads, and in time it might then be found convenient to arrange with the local boards to maintain provincial and imperial roads, on behalf of government. At present the *taluka* board overseers are not over-worked and in some districts are paid as well as sub-overseers in the Public Works Department. With the supervision of local board members I think they would be quite capable of erecting simple structures such as schools and *dharamsalas* even if the cost of such structures exceeded the limit of Rs. 2,500 imposed by government. The granting of further powers to local boards in respect of the construction of works must however be considered separately for each board in reference to the strength of its engineering establishment. If a good case is made out, then an alteration of the maximum prescribed could be made. Even under their present powers, it is quite open to a board to take over many local fund roads that are in charge of the Executive Engineer, but my experience is that the boards are not keen on this, but on the other hand the tendency is often to place more roads in charge of the Executive Engineer.

480. (III.) *Changes in organization.*—The object of the Department should be to obtain as many reliable officers

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as possible. I am informed by contractors that the sub-overseers from the government engineering college are more reliable than the old class of sub-overseers.

481. (IV.) Relations with other departments and sub-branches.—I think Executive Engineers should submit diaries of their tour to their departmental superiors through the Collector, just in the same way as the diaries of the other district officials are submitted. The Collector knows the state of his district communications probably as well as any officer, and his remarks on the Executive Engineer's diary might well assist the Superintending Engineer in controlling the Executive Engineer's tour especially where the Superintending Engineer was new to his charge.

482. (V.) Decentralization.—I think a discretionary grant should be given to Executive Engineers for obviously necessary and urgent repairs such as damage to a *kachers* wall, or wash-a-ways on roads.

MR. E. G. TURNER called and examined.

484. (President). The witness stated that he was Collector of Dharwar and had held the position of Collector for six years.

485. The methods employed by the Public Works Department could, he thought, be improved if subordinate supervision were reduced in favour of that by more qualified officers. In support of this argument, he had quoted in his written memorandum an example from his own experience which had occurred while he was in charge of the Salsette Development Scheme, where he had had the assistance of an Executive Engineer under whose direction certain works had been executed. The development scheme concerned the lay-out in connection with the town planning of Salsette, in order to provide for its future extension. At times of plague people left Bombay and built houses on the island of Salsette, without any supervision or control, and the gradual development of a town-planning scheme had hence been found necessary. He had been entrusted with the control of building operations and it was his experience that the work done there by his Public Works engineer was better and more economical than the works constructed by local municipal agency.

486. Instead of relying so much on petty contractors, he suggested that the Public Works Department should do more to encourage large contractors; he would like to get a better class of contractors in the Dharwar district if it were possible; at present there were none to be found. In the whole district there was only one fairly large contractor who, he believed, had formerly been employed in the Public Works Department as a sub-overseer. This man had then set up for himself, but witness did not know whether he had retired from the Public Works Department or had left the service for other reasons; he was a fairly wealthy man and could execute work up to the value of about a lakh and a half of rupees. There were two other men in the Dharwar district who were fairly large contractors in comparison with others in the district. The Public Works Department did endeavour to give work to such contractors but, as previously stated, there was difficulty in finding them. One method of encouraging large contractors would be to give out on contract all the fairly long roads in a given area, instead of getting the work done by piece-work. This method, however, had not yet been tried in the Dharwar district.

487. There were seven municipalities in the Dharwar district each of which employed an overseer or local *mistri*. These municipalities were self-contained and their building work was done sometimes by their own agency and sometimes by the Public Works Department. The estimated cost of one building which was being erected by the Public Works Department for one of them was Rs. 25,000. It was his experience that even in a large municipality, i.e., a town of 60,000 inhabitants, the municipality preferred to employ the Public Works Department when any large work was to be constructed. Smaller municipalities did not have much in the way of building work. In regard to school buildings, where government gave a grant they were constructed by the

483. (VII.) Education and (VIII.) Practical training.—The impression is that the training given is not sufficiently practical and that admissions are unduly restrictive. I have no experience of the working of the government engineering college and can offer no opinion, but it seems to me that admissions should be confined as far as possible to those who are likely to follow the engineering profession. Two of the higher revenue officials in the Dharwar district have passed the college course and obtained their engineering degrees. Neither had any intention of becoming engineers. One of them entered the college as he did not possess the necessary qualifications to enter an Arts college, but his sole object was to obtain a degree and enter government service as a graduate. The other entered the Revenue Department as he considered its prospects at that time were better than the Public Works Department.

Public Works Department, unless the local body obtained special sanction to do the work themselves. In such cases there was no difficulty in obtaining sanction.

488. The Executive Engineer was really the engineer for the district, and executed all the work which was paid for out of the funds in the district board's budget. In *taluka* boards, of which there were eleven in the Dharwar district, men of the type of sub-overseers were employed on a pay of Rs. 40 to Rs. 60 a month. The limit up to which a local board could execute works was Rs. 2,500; above that limit the work was constructed by the Executive Engineer.

489. Provincial roads were entirely in the charge of the Public Works Department, and all the more important roads which were paid for out of the district local board's budget were maintained by the Executive Engineer on behalf of the board. Only small roads in the *talukas* were directly in the charge of the *taluka* boards. A provincial road was one for which government paid, and which generally passed through more than one district. He thought that district boards had made over certain of their roads to the Public Works Department because they had no engineer of their own. They employed only men of the *mistri* class.

490. There was no tendency for district boards to create Public Works Departments of their own, but, should they do so, he saw no objection to the roads being handed over to them. In that event more work might be given to them and the limit of Rs. 2,500 raised according to the circumstances of each case. The district local board of Dharwar incurred an annual expenditure on roads of about Rs. 1½ lakhs, and he doubted if this was sufficient to justify the employment of a trained engineer. That district was one of the wealthiest in Bombay and paid a land revenue of Rs. 30 lakhs.

491. He did not agree with the proposal that the various civil departments should be made to undertake the annual repairs to their own buildings, except in regard to such items as whitewashing, etc., as all structural repairs required expert supervision. He did not think, for example, that any advantage would accrue if he were given a lump sum grant for ordinary current repairs to revenue buildings, as the Public Works Department could do this work better than he since they generally had a sub-divisional officer on the spot, and more plant, etc., than contractors could obtain.

492. He thought that the Executive Engineer should submit his diary through the Collector who knew his district probably better than anyone else and hence was in a position to say which roads were good and which bad. This would also give the Collector an opportunity for representing his own views in regard to the condition of the various public works in the district, and would be much more satisfactory than writing a special report criticizing another officer.

493. A graduate of an engineering college was qualified to enter the provincial service of the Revenue Department. He did not wish to debar such men from entering the Revenue service, but thought that, before they were

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admitted into engineering colleges it should be ascertained, as far as possible, whether they intended to follow the engineering profession or not. He would not, however, go so far as to prohibit students from entering any other department than the Public Works Department.

494. (*Sir Noel Kershaw.*) He was informed by a retired officer of the Mysore State that the system there in vogue of giving out the annual repairs on lengths of road on contract had proved a success.

495. He thought that the submission of the Executive Engineer's diary through the Collector would result in increased co-operation between the Superintending Engineer and the district officer.

496. (*Rai Bahadur Ganga Ram.*) In referring to large contractors in the Dharwar district he had meant men who would undertake the execution of a large work and do it satisfactorily. A big contractor with a reputation would not, he thought, require the same amount of supervision as a petty contractor. His main contention was that more direct supervision by the higher officers of the Public Works Department was required, and that men of the sub-overseer class should not be employed on supervising work, unless they could be trusted to perform it satisfactorily from all points of view.

497. He was president of the Dharwar district local board. He did not wish to press them to engage a qualified engineer, but if they did so, he saw no objection to the Executive Engineer being relieved of a portion of

his present work which could then be transferred to the local board.

498. (*Mr. Mackenzie.*) He had no knowledge of the roads in Bellary nor did he know whether they were under the local boards.

499. (*Mr. Cobb.*) In the case of repairs to school buildings a schoolmaster was allowed a very small sum for whitewashing, but nothing else. School fees were credited to the treasury. The repairs to all schools under *taluka* boards were done by the board's overseer, and the money debited to the educational fund. He thought that if government buildings were made over to the local boards they could carry out small repairs efficiently, but supervision could not be dispensed with.

500. (*Mr. Kent.*) With reference to the question whether revenue officials welcomed applications from graduates of engineering colleges for posts as *mamlatadars*, witness stated that he had already had two L. C. E.'s as Deputy Collectors, but he thought that they had practically forgotten all they ever knew of engineering.

501. He thought that the *mistri* class could be improved by forming them into a permanent government service, and this opinion was endorsed by a large contractor with whom he had discussed the matter.

502. He was not in favour of giving discretionary grants for repair works, as for example, to a head constable in charge of police lines situated far away from civilised parts, but would much sooner leave such repairs in the hands of the Public Works Department.

At Bombay, Friday, 12th January 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

C. S. COBB, Esq., M.V.O.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

R. J. KENT, Esq., Chief Engineer and Secretary to Government, Bombay.

D. G. HARRIS, Esq. (*Secretary*).

J. W. MACKISON, Esq., M.I.C.E., Executive Engineer, Bombay Municipality, Bombay.

Written Statement.

503. The Engineering Department of the Bombay Municipality is under the direction of the Executive Engineer and is divided into seven branches, viz. :—

- (1) Drainage.
- (2) Roads.
- (3) Buildings.
- (4) Regulations of buildings under the Municipal Act.
- (5) Mechanical and Workshops.
- (6) Lighting.
- (7) New Outfall Sewer.

504. The following superior staff assist the Executive Engineer in the conduct of his duties :—

- Deputy Executive Engineer, Drainage.
- Deputy Executive Engineer, Mechanical Branch.
- Assistant Engineer for buildings and architecture.
- Assistant Engineer, General Branch (Personal Assistant to the Executive Engineer).
- Resident Engineer, Love Grove outfall works.

505. The Executive Engineer personally conducts the executive duties of the following branches :—

- (1) Roads.
- (2) Buildings.
- (3) Regulations of buildings under the Municipal Act.
- (4) Lighting.

506. The duties of the Executive Engineer are—

- (a) to control generally the engineering operations of the municipality ;
- (b) to exact from all employes under him a strict performance of the duties assigned to each ;
- (c) to receive reports and communications from the Deputy and Assistant Engineers ;
- (d) to examine estimates and drawings and inform himself of the progress and completion of works ;
- (e) to suggest projects and designs suitable for effecting the objects proposed to him by the Commissioner or the Corporation ;
- (f) to dispose of such matters as may be left to his discretion by the Commissioner or the Corporation ;
- (g) to bring clearly before the Commissioner, accompanied by his own remarks, all subjects reserved for his decision.

507. The Executive Engineer is responsible that all projects for new works either prepared by himself or submitted to him by his deputies and assistants are prepared in a complete and proper form. He is also professionally responsible for the character of all such designs and estimates submitted by him or through him. The Executive Engineer prepares annually the portion of the budget estimates relating to his charge and after the close of each year submits a report of the progress made

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during that year and generally carries out the duties connected with the Engineering Department. The Executive Engineer also advises the Commissioner and the Corporation on all matters pertaining to private or public bodies such as the Bombay Port Trust, the City Improvement Trust, the Railway, Tramway, Electric and Telephone Companies.

508. Most of the new works pertaining to drainage and sewerage and costing over Rs. 3,000 are carried out by special contract. New works costing under Rs. 3,000 are carried out by the annual repair contractor. A few new works and also repairs and minor works which cannot properly be entrusted and minutely supervised are carried out departmentally. The staff engaged on drainage work consists principally of —

- 1 Deputy Executive Engineer, Drainage,
- 2 Assistant Engineers,
- 1 Head Surveyor,
- 1 Chief Inspector,
- 1 Head Plumber,

the total annual cost of the whole establishment including labour and including that employed on loan works being about Rs. 2,40,000.

509. New road construction work is generally carried out by contract, but all other works pertaining to roads, such as road widening, diversion, lowering or raising the surface, full metalling and patching works, bottoming, concreting, tar painting and watering are carried out departmentally under the Executive Engineer assisted by a permanent staff of —

- 1 Superintendent.
- 7 Inspectors.
- 7 Assistant Inspectors.
- 7 *Mistris*.

47 *Mukadams*.

The number of *coolis* employed on the roads averages about 1,600 and costs about Rs. 2,55,500 per annum. In addition to the ordinary work of road maintenance the staff shown above also attends to the restoration of road openings (extending to about 29 miles in length annually) made by other departments such as the Water and Drainage and by companies such as the Telephone Company, the Gas Company, the Bombay Electric Supply and Tramways Company, the Calender Cable and Construction Company, the Telegraph Department, licensed plumbers, etc., costing nearly Rs. 3,00,000 per annum.

510. New municipal buildings of importance are erected under contract. Repairs to buildings in municipal charge and minor structures are carried out by the annual petty works contractor when the cost thereof in any case is less than Rs. 3,000. There are about 413 municipal buildings and structures distributed throughout the city. The staff employed on buildings works consists of —

- 1 Assistant Engineer, Buildings and Architecture,
- 1 Architectural Surveyor,
- 5 Inspectors,
- 2 Estimators and Measurers,
- 1 Surveyor,
- 1 Quantity Surveyor,
- 7 Draftsmen,
- 3 Tracers,
- 2 *Mistris*,
- 3 *Mukadams*,

the total annual cost of the whole establishment being about Rs. 37,000.

511. Many of the provisions of the Bombay Municipal Act relating to streets and buildings and the whole of the building bye-laws have been delegated to the Executive Engineer. Plans for new private buildings or for alterations or additions to existing buildings submitted for approval number about 3,500 per annum. Each plan is carefully scrutinized to ensure compliance both structurally and sanitarily with the Act and the bye-laws and to ascertain if any land may be required for road improvement. The buildings under construction are regularly visited and reported on by the staff. From two to three thousand notices are annually issued against house owners under various sections of the Municipal Act and about 700 prosecutions are annually instituted in the magistrates' courts for non-compliance with the notices

served. The notices issued for the removal of dangerous or ruinous buildings number from 300 to 400 annually and about 120 cases of insanitary huts or dwellings are also dealt with.

The Executive Engineer is assisted in this work by—

- 4 Divisional Superintendents of Buildings,
- 12 Inspectors,
- 12 Assistant Inspectors, and
- 24 *Mukadams*,

the total annual cost of the staff being about Rs. 1,01,800. In addition to the above there is one acquisition officer with an assistant and clerk engaged on the acquisition of properties required for improvement schemes, over-bridges and street widenings under setback regulations and otherwise. The annual cost of this establishment is Rs. 7,344. Section 344A of the Municipal Act provides that every person who intends to erect a building shall employ a person who shall be competent to the satisfaction of the Commissioner to supervise the erection of such building and the Commissioner may in each case require that the person to be so employed shall be a licensed surveyor. Under Section 355 of the Municipal Act the Commissioner may, grant to any person he thinks fit a license to act as a surveyor or as a plumber for the purposes of the Act. Each such license is for a renewable period of one year. Under Section 356 of the Municipal Act the Commissioner may, with the approval of the Standing Committee, from time to time prescribe regulations for the guidance of licensed surveyors and plumbers. The Executive Engineer has been specially empowered to exercise the powers of the Commissioner in respect to licenses to surveyors and plumbers and has issued licenses to 61 surveyors and 132 plumbers.

512. All mechanical works pertaining to the several departments of the municipality are carried out departmentally by the staff engaged at the municipal workshops. This includes such works as repairs to tools, plant and machinery including repairs to pumping plants, steam rollers, motor wagons, labour carts, watering carts, meat vans and also sundry new works. Large castings are obtained through private agency. The staff of the mechanical branch workshops and pumping stations consists principally of —

- 1 Deputy Executive Engineer, Mechanical Branch,
- 1 Head Foreman,
- 1 Senior Engineer,
- 9 Assistant and Supernumerary Engineers,

the whole staff costing about Rs. 1,61,800 per annum. In addition to this, there is a staff employed for the working of steam tip and petrol wagons which costs annually Rs. 27,186.

513. The lighting of the city with gas is done under a contract extending over a long period. The lighting with oil in outlying districts is done departmentally, the oil and lamps however being obtained by contract. The number of oil lamps is 1,344 and these are being rapidly replaced by gas lamps which now number 6,253. The total annual cost of street lighting amounts to about Rs. 3,92,285 for gas and Rs. 29,887 for oil or in all Rs. 4,22,172 exclusive of experimental high pressure gas lighting. The street lighting is supervised by three lighting inspectors assisted by fourteen *mukadams*. The cost of this establishment is about Rs. 7,104 per annum.

514. The first section of the new outfall sewer along the foreshore was carried out through the agency of a local contractor at a cost of about Rs. 2,50,000. The remaining work in the deep sea, estimated to cost about Rs. 21,00,000, is being carried out departmentally, as no contractor in India was found willing to undertake this very risky sea-work. The staff engaged on this work consists principally of —

- 1 Resident Engineer,
- 1 Foreman Diver and Works Manager,
- 2 European Divers,
- 4 Chinese Divers,
- 1 General Foreman,
- 1 Mechanical Foreman,
- 2 Assistant Foremen,

and costs about Rs. 68,000 per annum.

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515. The municipality has a central stores for the supply of articles to its various departments. The different articles of stores are divided up into about 70 groups or "schedules" and tenders are annually invited by the store-keeper. Municipal works contractors are generally allowed to obtain and use their own materials, but they can also obtain them at the municipal central stores. In the case of large works, however, the contractors are compelled to obtain such articles as cement, pipes, bends, junctions, manhole covers, etc., from the municipal stores where large stocks of these articles are held in reserve. This is done with a view to economy, as the contractors could not buy them cheaper elsewhere, and to ensure the use of good-quality materials. The engineering department has also a separate annual contractor for the supply of materials not in common use or such as cannot conveniently be stored. Materials such as metal, sand, sand-stone and rubble-stone which are required in very large quantities for road maintenance are obtained on annual contracts. Coke for use in steam rollers and tar for tar macadamising of roads are obtained from the Bombay Gas Company on annual contracts.

516. For the transport of road materials the municipality employs bullock carts which are supplied by an annual contractor. Bullock pairs are similarly obtained for working hand rollers and for roadwatering, the carts in the latter case being provided by the municipality.

(2). Your reporter does not have an intimate acquaintance with the organization, methods and procedure of the Buildings and Roads Branch of the government Public Works Department, but during his 26 years of municipal service and five years of private practice he has had a very wide and varied experience in the design and execution of all kinds of public buildings, city improvement schemes, sea walls, sea outfalls, reclamation works, bridges, drainage and water-works and in the construction and maintenance of streets, roads, tramways and sewers both by private agency and direct labour. From personal observation and experience your reporter would affirm that as a general rule such municipal works as the larger buildings, main sewers and new roads (often requiring special plant and a lot of casual labour) can with advantage and economy be carried out under contract, whilst on the other hand minor and all repair works and maintenance can more advantageously and with greater economy be done departmentally, and more especially so when there is a skilled public works agency as at present employed.

517. (I.) **Economy and suitability of methods of execution of public works.**—The methods at present adopted by the Bombay Municipality for the execution of works are economical and suitable for the purpose for which they were devised with exception in regard to minor and repair works presently carried out by annual petty works contractors. Such works would be done better and at less cost departmentally.

518. (II.) **Encouragement of other agency.**—Under the existing system private enterprise is sufficiently encouraged and with the exception of the larger buildings, main sewers and new roads as above stated it is not desirable to entrust the construction work of this municipality to private agency. All road and other maintenance work and also works involving health considerations such as the jointing of pipe sewers and water mains can best be carried out departmentally. In this connection reference may be made to the Record of Proceedings of the Irish Roads Congress held in Dublin in 1910 when there was a large representative gathering of road engineers in attendance and when the question of the contract and direct labour systems was discussed. In Ireland, where the road conditions are not very dissimilar to those in India, both the contract system and the direct labour system have been in operation. At the congress in question the preponderating weight of opinion was certainly in favour of the direct labour system and instances were given of substantial reductions being effected and at the same time of increased

efficiency being thereby secured. The following resolution was also passed :—

"That it is very desirable that all quarries from which stone is obtained for the repair of public roads be owned or leased by the County Councils."

519. (III.) **Changes in organization.**—In the event of municipal works now executed by the annual petty works contractors being undertaken departmentally, additional labour would of course be required, but little addition would be needed to the superior staff as those now engaged in supervising would be available for the conduct of operations.

520. (IV.) **Relations with other departments and sub-branches.**—The Municipal Works Department meets the needs of the other departments of the administration satisfactorily.

521. (V.) **Decentralization.**—Further decentralization within the Municipal Public Works Department is not desirable.

522. (VI.) **Simplification of procedure.**—The Code is not applicable to municipal works.

523. (VII.) **Education.**—The system of education and the standard of instruction in government engineering colleges appears to be sufficient.

524. (VIII.) **Practical training.**—The great defect in the education of engineers in India is the lack of practical training. There is nothing in the nature of apprenticeship or pupilage. The student when he graduates considers himself a fully qualified engineer and the fact that he has become a Licentiate of Civil Engineering is, under the Municipal Act considered a sufficient test of professional qualification to secure his admission into the closed profession of licensed surveyors. Section 355 (2) of the Municipal Act runs as follows :—

"If any applicant for a license to act as a surveyor is a Licentiate of Civil Engineering or a person who has passed some test of professional qualification equivalent to that for a Licentiate of Civil Engineering, his application shall not be refused by the Commissioner, except with the approval of the Standing Committee and upon the ground that the applicant is unfit through incompetency, misconduct or other grave reason to hold such license."

No graduate should be recognised as a qualified engineer until he has served an apprenticeship of at least three years with a competent firm of engineers and had one year's practical experience either in an engineering workshop or on engineering works. The result of the present system is that very few of the 61 surveyors licensed by the municipality have any clients of their own or are consulted as professional men. When any engineering or architectural work is required, it is the common practice of landowners and proprietors to have recourse to the family *mistri*. This individual, who is generally a partially-trained craftsman with a more or less imperfect knowledge of the various trades, acts as agent and adviser. As he himself is incompetent to prepare and submit plans for approval and to comply with the statutory requirements, he employs a licensed surveyor to do so according to his directions and subsequently employs the various tradesmen and controls the building or other operations himself. The surveyor thus in many cases becomes a mere tool in the hands of the *mistri* in whom he depends for employment. If engineers had a better practical training and their advice could be relied on, their status would be raised and the family *mistri* would disappear.

(2). What is wanted in this country a great deal more than the training of engineers is the training of workmen and inspectors. At present masons, carpenters, plumbers and other craftsmen serve no apprenticeship to their calling. This should be made obligatory by legislative enactment and only holders of approved certificates of competence should be allowed to be employed in the several crafts. Inspectors should be men who have served an apprenticeship to one craft and who possess a general knowledge of others. They should preferably be selected from men who have, on account of their knowledge and skill, been promoted to the position of foreman, and should have had control of men and materials.

525. (General.) Until considerable advance has been made on existing conditions it does not appear to be

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desirable to entrust works at present carried out by the Public Works Department to private agency, as it is

very improbable that there will thereby be any gain either in economy or efficiency.

MR. J. W. MACKISON called and examined.

526. (*President.*) The witness stated that he was the Executive Engineer of the Bombay Municipality, and had held the post for six years. He had been recruited from Scotland and was now in charge of the whole of the engineering establishment of the municipality.

527. New roads for the Bombay Corporation were built by contract, but repair work was generally done departmentally. The Corporation did a good deal of building work in Bombay.

528. There were about a dozen private contracting firms in Bombay capable of undertaking works of practically any size, but their staffs were not trained and required constant supervision. The heads of these firms were not craftsmen themselves but were more of the nature of financiers than tradesmen. They employed *mistris* who had a fair idea of the different trades, but very few had an engineering staff. When working for the Bombay Corporation contractors generally utilized the Corporation's staff to set out their work, and required an enormous amount of supervision. The Corporation's men did practically the whole of the management and were kept continually on the spot. The Bombay Corporation generally employed an inspector on the direct supervision of a work, and probably a few *mistris* who remained constantly on the spot. The superior staff also went round periodically to see that things were progressing satisfactorily. The municipality employed four superintendents to supervise the erection of all buildings in the city. Under these were the inspectors who, before they could rise to the rank of superintendents, had to qualify by passing the L.C.E. examination. The municipality insisted on these inspectors being either L.C.E. or B.E. men. Under these inspectors were assistant inspectors who were not necessarily L.C.E.s., but promotion to inspectorship was barred unless they had passed that examination. Inspectors and assistant inspectors corresponded roughly to the upper and lower subordinates of the Public Works Department.

529. The *mistris* of the Bombay Municipality were employed in various ways, some in detecting unauthorised works and encroachments, others in watching the proportions of concrete and mortar and the quality of materials put in by contractors. On municipal building works the *mistris* were temporary men specially engaged for each job. As, however, all the buildings in the city required supervision, several *mistris* were employed to go round and see that the building rules were not contravened by contractors. The Bombay Municipality thus found it necessary to employ a staff consisting of various grades as previously enumerated.

530. He approved of the suggestion that the lower subordinate staff of the Public Works Department should be largely reduced and practical workmen substituted in their stead. He was also inclined to advocate a similar system in connection with the assistant inspectors and *mistris* of the Bombay Corporation, but thought that, before it was introduced, these *mistris* should have more practical experience in their trades.

531. The Bombay Corporation found it necessary to supply large contractors with the materials required for construction, as for example, cement, etc., as the latter found it difficult to obtain the quality specified by the Corporation, and were not to be trusted to obtain such materials themselves. The Corporation obtained the materials they required through the agency of the municipal central stores. About seventy schedules for various materials were issued every year. All the pipes, machinery and a portion of the cement required were obtained from England. Some cement, however, was obtained locally. The purchase of materials from England was entrusted to supply firms who had agents in Bombay, but special machinery and plant were secured direct from the latter country. This procedure had been found quite satisfactory.

532. The percentage of establishment charges fixed for the Bombay Corporation was 5 per cent. of the expenditure on works. This, however, did not include the superior staff but only the men directly employed on works. It would include the resident engineer and foreman specially appointed for a work. It was very often found possible to work on a lower percentage.

533. Repair works were better and more economically carried out departmentally than through contractors. When the services of a contractor were utilized it was generally found necessary for the Corporation staff to go into more detail in the preparation of plans and estimates for the sanction of the Commissioner than would otherwise have been necessary. A contractor always worked on hard and fast rules, and in ordinary repair work the employment of such a man resulted generally in numerous demands for small extra payments for petty items.

534. An outsider was sometimes asked to undertake the preparation of plans and estimates for a building but, generally speaking, such work was done by the establishment of the Corporation which system, he thought, was better than going into the open market.

535. The architectural branch had recently been strengthened by the appointment of a qualified Assistant Engineer for buildings and architecture recruited from England and the Corporation usually carried out, with their own staff, any architectural work that was required. He had very little experience of the employment of private contractors in Bombay for the preparation of plans.

536. He had found that the men turned out from the Poona College were quite capable, but required more practical experience. He thought the Bombay Corporation would be prepared to take a small number of such men as apprentices, and that other public and private bodies should also do so. These students should, he considered, undergo a practical training of at least two years' duration, and he would prefer three so as to allow of a year's experience in a workshop. His own office would certainly be prepared to take a limited number of these men. At the present time it took on such men as tracers, but there was not a proper system for training them. He thought that the correct course to adopt would be to give them Rs. 25 a month during the first year rising to Rs. 40 in the last year.

537. The Assistant Engineer for buildings and architecture employed by the Bombay Corporation prepared, in the first instance, the plans of new buildings; but the witness was required to satisfy himself that all projects for new works, either prepared by himself or submitted to him by his deputies and assistants, were prepared in complete and proper form, and he was also held professionally responsible for the character of all designs and for estimates submitted by, or through, him.

538. In connection with the system of accounts followed by the Bombay Corporation, he had a chief clerk, and accountant and a large staff of clerks. The head of each branch was responsible for his own accounts, which were submitted after compilation to the central accounts office of the Corporation, and the Executive Engineer was responsible for the accounts of his whole Department. He thought that, under the present system, an excessive proportion of the time of the Executive Engineer's staff was employed on accounts work, but this was an almost universal complaint, and in no way peculiar to the Corporation.

539. Practically all works had to be sanctioned by the Commissioner in the first instance. In the case of a large project the Commissioner accorded his sanction to the whole work, but, in the case of alterations and additions, the Executive Engineer could carry them out subject to a maximum cost of Rs. 2,000. When it was desired that alterations should be made in a building, the construction of which has been sanctioned by the Commissioner, it was not necessary to submit the detailed

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plans and estimates to him again. Contracts were sanctioned by the Commissioner and by the Standing Committee.

540. In connection with the system of licensing surveyors he said that a large number of buildings had collapsed in Bombay and hence it was thought that some responsibility should be thrown both upon the owners of property and upon the architects employed by them. It was, therefore, laid down that all plans should be submitted through a licensed surveyor. The Corporation was bound to accept any surveyor who had passed the L.C.E. examination whether he had any practical experience or not. Such men, after submitting the plans and obtaining the approval of the Corporation, were supposed to look after the construction of the work themselves, sending in a certificate on completion to certify that all the materials used had been of good quality and that they themselves had actually supervised the work. After receipt of such a certificate the Corporation sent their own superintendent to examine the work and satisfy himself that it had been built in accordance with the plans. As a matter of fact the witness had found that very little supervision was exercised by these licensed surveyors. The majority of them depended for their instructions not on the client but on the *mistri*, who was generally a hereditary craftsman who did all the work for a particular family, and it was these *mistris* and not the clients who actually retained the architects.

541. When contractors were employed on fairly large works they, in their turn, largely employed petty contractors.

542. (*Mr. Cobb.*) Great trouble was experienced by the municipality in supervising contractors. Their work was most inefficient as they were apt to employ ordinary *coolis* as carpenters and masons. The municipality had had to strengthen their bye-laws very considerably on this account.

543. Most of the inspectors employed by the Bombay Municipality were recruited from the Poona College of Engineering. These men required a good deal of experience before they could be relied upon to supervise a large work, but they were the best class of men which the municipality could obtain.

544. In regard to the question of obtaining the Commissioner's sanction prior to the execution of a work, he remarked that very often it was the Commissioner himself who initiated proposals. Funds were then voted for the building in the annual budget, and the scheme was laid before the Standing Committee in contract form for their acceptance. Although buildings were designed by the Assistant Architect, reports regarding them were made by the Executive Engineer direct to the Commissioner, the engineer for buildings and architecture being subordinate to the Executive Engineer.

545. When special stores were required by the Bombay Corporation they engaged the services of Sir John Wolfe Barry. It was difficult in Bombay to obtain information regarding all the recent improvements taking place in England, although the Corporation kept themselves fairly up-to-date by taking in all the best engineering papers published in England and America.

546. The figures he had submitted in his written memorandum (paragraphs 508 to 510) included the cost of labour and establishment, but not that of materials.

547. (*Rai Bahadur Ganga Ram.*) The Bombay Corporation was not bound, and had never found it necessary, to obtain materials from the Director General of Stores at the India Office. The rates paid by the Bombay Corporation for stores were not, he thought, very different from those paid by the Public Works Department and the former were often supplied with copies of the Public Works Department and Improvement Trust rates. He could not, however, say for certain whether stores were supplied by the India Office at cheaper rates than those at which the Corporation obtained them. The latter had their own specifications, which were much the same as the British standard specifications. The Bombay Corporation had a central stores which arranged for the supply of materials to all its departments. The storekeeper in

charge fixed the rates, but the witness was unable to give detailed information in this connection.

548. The cost of the superior staff engaged on the construction of works was allocated partly against the Loan Funds and partly against Revenue. Exclusive of this cost, the total percentage of establishment charges did not exceed 6 per cent. on the work executed and this included the preparation of plans and estimates, and office establishment. He was not sure whether the accounts establishment was included in this figure, but believed that it was allocated partly against "Works" and partly against "Revenue." The Bombay Municipality employed a regular salaried auditor for their accounts and in addition two outside auditors to whom they paid a fixed sum for the work done by them.

549. He thought that the Corporation would be willing to undertake the practical training of students and to pay them a living wage only to the extent of the number of vacancies in their staff. Such men would be taken on as apprentices. To undertake the training of more men than the Corporation had room for would mean a dislocation of the duties of their senior officers. The limit, he thought, would be four or five annually.

550. Licensed surveyors, before they could practice as architects, were charged Rs. 75 by the Bombay Corporation for their licenses. The architectural assistants employed by the Bombay Municipality furnished the complete designs required for the building to be executed. The Executive Engineer gave an indication of what he required in the first instance and went into the matter in more detail on the completion of the design.

551. He did not know how the rates paid by the Bombay Municipality for bricks compared with those paid by the Public Works Department. The former paid Rs. 16 to Rs. 18 per thousand.

552. (*Mr. Mackenzie.*) The Bombay Municipality employed contractors for special works, even though they had to supply the engineering staff themselves, because contractors could command a better supply of labour than the Corporation. He admitted that this system did not encourage indigenous engineering talent as the contractors depended on the municipality to supervise their work.

553. If the system of taking apprentices from colleges were properly organized, such men would in time be allowed to draw up plans themselves and would thereafter be sent out on to the works to obtain the necessary practical instruction. There was at present no system of apprenticeship at all, but he thought that, if such a system were introduced, although a great deal of trouble would be experienced on the part of the staff undertaking the training, the students would be greatly benefitted thereby especially in regard to building work, and that such training would eventually fit them for supervisor's posts, which they would probably fill better than the present class of entrant. They would be employed in the first instance to assist senior men in measuring up works and in preparing plans, thus gaining experience by observation as they went round. Apprentices in England did not invariably pay premiums, but some were taken on, as they were required, to do the less important work such as tracing, writing out specifications and schedules, etc., thus giving some return even during their apprenticeship to the firms which trained men. As far as his experience went these apprentices, after receiving their training, left and sought employment elsewhere.

554. He was not able to give any information as to why there was such a difference between the charges for establishment and supervision in the Public Works Department and those in the municipality as he had never gone into the question.

555. (*Sir Ncel Kershaw.*) Licensed surveyors were at present employed by the Bombay Corporation. He did not attach much importance to these men who were not generally engaged by responsible parties, and who did, for the most part, simply what the *mistris* asked them to do. They were not paid a percentage as a professional man should be paid but were merely given a few rupees which could not be held to constitute a proper remuneration. They were useful in a way, but he thought that a

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practical training for licensed surveyors should be insisted on, i.e., that they should be compelled to serve an apprenticeship before being admitted to a closed profession.

556. Contractors were bound to purchase certain stores required from the municipal stores. He did not think that contractors objected to this restriction as good material was thus procured. He admitted, however, that contractors demanded high rates for labour. They generally paid ten to twelve annas for their labour whereas the municipality when doing a work themselves paid only seven or eight annas for their labourers; the contractors, however, employed stronger men from whom they got more work and they were able to push them harder than the municipality could.

557. (*Mr. Kent.*) The *mistris* employed by the Bombay Municipality were of considerable importance in the building operations of the city; they acted, in fact, as controllers, agents and advisers. They had no general knowledge of trades and only a moderate notion of the prices of materials and labour; occasionally they acted as small financiers. He thought it possible that these men could be improved by the issue of licenses in the same way as plumbers, who had to obtain licenses to carry on their trade. Each craftsman should serve an apprenticeship in his respective trade after which a license would be issued to him. This system, however, would have to be introduced very gradually. He thought that such a craftsman with a little theoretical and practical training would be a more efficient supervisor of works than the present Public Works Department sub-overseer and agreed with the suggestion that such men might well be substituted for the sub-overseer in that Department. He considered that the present subordinate staff employed by the Public Works Department on supervision, i.e., those corresponding to the inspectors employed by the municipality, were too highly trained theoretically and advocated a college course of two years' practical and three years' theoretical training for such men. The practical training should be given before or along with the theoretical training, and it would often be possible to arrange practical work for them during the term. In order to curtail the length of the period of training he suggested a system of morning classes during apprenticeship and referred to the practice obtaining in England of holding both morning and evening classes. This he thought would obviate the late age (now about 25 years) at which such men would be sufficiently trained to take up employment.

N. MAUGHAN, ESQ., M.I.C.E., Drainage Engineer, Bombay Municipality.

Written Statement.

564. (II.) *Encouragement of other agency.*—For large works I have always found it far more satisfactory to carry out works by contract provided experienced contractors of some standing can be obtained and efficient and reliable supervisors are appointed. A contractor has many advantages over a government or municipal officer in arranging for the satisfactory execution of any work. He is bound by no departmental or other rules. He can obtain materials and labour where he likes, he can employ labour by piece-work or by time, in short he is his own master and does as he likes provided he complies with the terms of his contract. I do not know what rules prevail in the Public Works Department regarding carrying out works departmentally, but in the Bombay Municipality an officer must obtain all his materials from the Stores Department who may or may not have what he requires in stock. Also he may not employ labour except at certain fixed rates, such rates being based as a rule on a favourable market, that is to say when labour is plentiful. Small works can frequently

558. The materials, i.e., stores and machinery, obtained by the municipality from England were both inspected and tested there by Sir John Wolfe Barry, who was their consulting engineer.

559. There were two reasons why road repairs in Bombay city were done departmentally by the municipality and not on the system of giving out lengths by contract; firstly because the municipality had to supply the rollers required, secondly because it was very difficult to control the quantities of material supplied by the contractors, or to check the material actually put into the road.

560. There were two or three good architectural firms in Bombay.

561. For a large work which was at present being constructed by the municipality at Love Grove, they had tried to get a contractor in India but had failed to do so. One firm in England had tendered for the work but their rates were exceedingly high. The municipality was now doing the work departmentally.

562. The Bombay Corporation had never asked the Public Works Department to carry out works for them in his time. With reference to the King Edward Hospital and to the fact that it had been designed by the Consulting Architect to the Government of Bombay for the Corporation, he explained that, if he had had to carry it out, he would have required additional staff as it was a work costing about Rs. 30,00,000. The Corporation did not prepare the plans and estimates of this work as it was altogether special, only part of the funds being provided by the Corporation and the balance being met by outside donors. The question of whether the Corporation would construct this work according to Mr. Wittet's plans was under consideration, but he understood that government were contemplating carrying it out on behalf of the Corporation and other donors.

563. (*Rai Bahadur Ganga Ram.*) With reference to a suggestion that works designed by the Public Works Department might be executed by the municipality in return for a percentage allowance for establishment he explained that it would be a very unusual procedure for one body to carry out works designed and estimated by another. It would require a special staff and would also throw an unlimited amount of extra work on the present staff which was already fully occupied. He admitted, however, that he had not considered the question before.

be carried out to advantage departmentally, the reason being that they only attract a second-rate class of contractor of little experience, but for the reasons given above I have always found that for large works the contract system is superior.

565. (III.) *Changes in organization.*—I have very little knowledge as to the inner working of the Public Works Department, but I hold and have always held the view that the Public Works Department does not give sufficient encouragement to its members to specialize in the various branches of engineering. My views of course are based on my knowledge of the Bombay Presidency. I understand that an engineer who has for instance spent most of his service on irrigation works may be transferred on promotion to a position where he has to deal with the maintenance of roads and buildings or he may be asked to draw up a scheme for the water-supply or drainage of a city. No engineer can be or ever hope to be an expert in every branch of civil engineering, and I am therefore of opinion that government should encourage specialization to a far greater extent than they apparently do at present.

MR. N. MAUGHAN called and examined.

566. (*President.*) The witness stated that he was Drainage Engineer to the Bombay Corporation, and had held that appointment for 16 years.

567. He stated that all the large drainage works of the Corporation were given out on contract and were not done departmentally. There were no sanitary engineer.

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MR. N. MAUGHAN.

[Continued.]

ing firms in Bombay in the strict sense of the word. There were, however, firms of ordinary contractors who were accustomed to excavation work, etc., and who undertook sanitary engineering work as well. These contractors were not specialists in any way.

568. The drainage schemes of the Corporation were prepared by the Corporation staff and after approval by their consulting engineer at home they were constructed by contracting firms who were, however, primarily financiers. These contractors did not as a rule employ petty contractors but did the work themselves, and very rarely sub-let their contracts except occasionally in the case of excavation. They employed no engineering staff beyond a *mistri*, and required very detailed supervision. He had a whole-time permanent inspector allotted to each work who supervised the construction with the help of *mistris*. Contractors all the world over required strict supervision, as they all worked for profit and therefore did the work as cheaply as possible.

569. The cost of establishment in his branch was more or less uniform whether there was much work going on or not as practically all the staff were permanently engaged. At a time like the present, when finances were at a low ebb, the percentage would be high, but ordinarily he thought that on an average expenditure of five or six lakhs a year the cost of establishment would come to about Rs. 24,000. This included all the special establishment employed for the supervision of drainage works but not direction and accounts charges.

570. The witness was responsible for the whole of the accounts of his branch, and submitted them monthly to the Chief Accountant. Only a small proportion of his time was taken up by this work, and he did not consider it to be a heavy burden. His accounts clerk compiled the monthly accounts and submitted them through the head clerk and Assistant Engineer, so that they came to him cut and dried, and unless there was any special point requiring settlement not much of his time was taken up in that way. Nor did his Assistant Engineer find the accounts work heavy, and in general the objections raised were not excessive. He made payments to the permanent staff, but as regards the contractors he had simply to give a certificate on the bills and the payments were then made by the Chief Accountant. The witness was not allowed to make any advances to the contractors but could certify *ad interim* payments for work done, which payments were made by the Chief Accountant.

571. He could sanction works up to about Rs. 100. All other estimates had to go to the Municipal Commissioner. When a work was in progress any changes in design or method to which there might possibly be an audit objection had to be sent up for sanction, in order to satisfy the Accounts Department.

572. The large contractors employed in Bombay did not keep any permanent supply of labour but engaged their men from time to time and paid them direct.

573. As regards the plea for specialization in India put forward by him in his written evidence he explained that what he advocated was, for instance, that the appointment of Sanitary Engineer to Government should be filled by a man with a special training in that branch of engineering, but not by one who had never specialized, but had merely been transferred from the Irrigation or the Buildings and Roads Branch of the Public Works Department. He meant that it was not sufficient to create a post of Sanitary Engineer to Government, if the officer selected to fill that post had no training in sanitary engineering.

574. He was not concerned with the purchase of stores. He gave an estimate of his requirements to the central storekeeper who made the necessary arrangements for supply. He had nothing to do with the actual purchase of stores nor with the system adopted for that purpose, but he tested such materials as pipes, cement, etc.

575. (*Rai Bahadur Ganga Ram.*) The witness had specialized in drainage engineering. He had been articled to a firm of consulting engineers in Westminster who were experts in water and drainage engineering.

576. The contractors he employed did not sub-let their contracts but worked by daily labour and probably made a profit of between 10 and 15 per cent. He was of opinion that, even if they were skilled engineers, the fact would not relieve the supervising establishment to any large extent. Everything they did would still require checking. There would not, in his opinion, be much difference in this respect between a contractor who was a skilled engineer and an ordinary contractor, except that the former would probably do his work more expeditiously. He would, however, require equal supervision and hence there would be no saving in establishment.

577. (*Mr. Kent.*) He considered that the system of getting stores from a central depot was more satisfactory than that of each officer obtaining his own stores in the open market provided there was a competent storekeeper to see that articles did not run short. When he was first appointed to the municipality the different departments purchased their own stores, but owing to objections raised by the Accounts Department to this practice the system of having a central stores depot was introduced.

578. (*President.*) He did not think that there were in Bombay any firms of consulting engineers who were competent to undertake the design and construction of drainage or water-works schemes for towns. The existing firms were merely contracting firms, and not consulting engineers as the term was understood in England.

P. G. MESSENT, Esq., C.I.E., M.L.C.E., Chief Engineer, Bombay Port Trust.

Written Statement.

579. (VII.) Education.—I may say that I do not consider that the instruction given at the Poona College or any other engineering college can turn out fully qualified civil engineers until their theoretical training has been supplemented by two years' practical training. The Institution of Civil Engineers now insist on two years, apprenticeship or pupillage before admitting as an Associate Member, without examination, anyone who has taken one of the recognised engineering degrees. The term is three years in the case of anyone who has not taken a degree but he must also pass the examination of the Institution. I have at present on my permanent and temporary staff nine graduates of the College of Engineering, Poona, who took their degrees in various years between 1882 and 1913. They are all now useful assistants.

(2) I consider that both the present and proposed courses at Poona are good ones and that those who take their degree become useful assistants after two years' prac-

tical work provided they are keen on their profession and continue to read up engineering books, especially those treating of the particular branch on which they are employed. The only fault I have to find is the late age at which the majority pass out of the Poona College. The most of them are 25 years of age. I consider they should have finished their two years' practical training by this age as is the case in England. I may mention that my last two Assistant Engineers from England, after taking what is practically an engineering degree at Cambridge, served three years' pupillage and were employed as Assistant Engineers in England at the age of 25.

(3) I have also had several students from both Poona College and the Victoria Technical College for a year's practical training as mechanical engineers in the Port Trust workshops. They generally have a very theoretical knowledge but are not very good at practical work. Those who are anxious and willing to get on learn more quickly than the apprentices who have not had the advantage of a college education,

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MR. P. G. MESSENT.

[Continued.]

MR. P. G. MESSENT called and examined.

580. (*President.*) The witness stated that he was the Chief Engineer of the Bombay Port Trust and that he had held that appointment for 19 or 20 years. He had not been appointed direct to that post but had come out from England in 1884 as an Assistant Engineer and had been subsequently appointed as Chief Engineer.

581. He employed two Honorary Assistant Engineers (upper subordinates with honorary rank of Assistant Engineer), together with a staff of overseers, supervisors and so on for supervision work in addition to Assistant Engineers from England. Men were taken on according to the amount of work in progress, but there were half a dozen men permanently employed.

582. Several of the larger works of the Bombay Port Trust had been carried out by contractors, but their big reclamation scheme had been done departmentally. As examples of large works executed by contract the witness instanced the Prince's Dock, the Victoria Dock, the Merewether Dry Dock and the Ballard Pier, all of which were carried out by European contractors. The Alexandra Dock and the Hughes Dry Dock, lately completed, were also constructed by a firm of contractors from England. These were special works, and such as no Indian firm could undertake. A good deal of the ordinary building work of the Port Trust was done by Indian petty contractors. It was not the general practice to give out a large work to a single contractor. The witness instanced the case of Transit Shed No. 14 in the Alexandra Dock which cost about Rs. 1,40,000 in which the excavation work was given to one contractor, masonry to another, windows to another and so on, and stated it as his opinion that that was the best method of getting work done. The whole of the transit sheds and wharves in connection with the Alexandra Dock were carried out by small contractors with the exception of the iron-work. In addition to the superior staff the Port Trust employed several *mistris* continually for direct supervision of work. These *mistris* were mostly practical masons. In particular cases the Port Trust employed a European masonry inspector on their dock works, otherwise an overseer and a sub-engineer were continually on the spot. The *mistris* he had referred to were all temporary, and although some of them had been for many years in the service of the Port Trust none of them had been brought onto the permanent staff.

583. Very little of the Port Trust work was executed by private engineering firms in Bombay. Items of work such as reinforced flooring, steel-work, etc., were occasionally given to such firms but otherwise the witness had had very little experience of them. Firms of that nature were ready to execute work either on plans and estimates drawn up by themselves or on those drawn up by the witness, but in the former case all plans and estimates had to be approved by him.

584. The Port Trust occasionally engaged private architects for special buildings but did not employ a whole-time architect of their own as there was not sufficient work for the latter. When a private architect was employed he was responsible, in accordance with accepted principle, not only for the design but also for the structural stability of his work. The execution, however, was supervised by the Port Trust officers.

585. In connection with the system of accounts followed by the Port Trust he explained that he had a book-keeper who kept the accounts necessary for his own information, but that he in general had nothing to do with them. The Chief Accountant, who was entirely separate from his office, maintained the accounts which were subject to check by a government auditor. This system worked satisfactorily, but the number of objections was very large.

586. He had several graduates of the Poona Engineering College on his staff and considered that they were satisfactory on the whole when they had gained some practical experience. These men were taken direct from the college and trained by the Port Trust and had to be given pay at the commencement, otherwise they would not come. He mentioned that his last two English Assistant

Engineers had received their engineering training in England. He had no experience of Indians who had received their training in England.

587. He thought that the upper subordinates turned out by the Poona College of Engineering were given rather more theoretical training than was really necessary for the class of work they were required to do, but was not in favour of any proposal for reducing the theoretical course and giving more attention to practical training in college as practical training to be of any use must be given actually on works. He did not place much reliance on workshop training in colleges and considered that there should be a special period of two years' practical training added to the college course. He thought that the Port Trust would be prepared to take apprentices for practical training for such a period, and that they would probably even be willing to take one or two such men in addition to their actual requirements, but this would of course depend on the extent of the works being carried out. Only such men as were really required could be given a living wage and he did not think that the Port Trust would be justified in giving such a wage to other apprentices. He doubted whether it would be feasible to introduce a scheme under which the conferring of the degree would be postponed until the two years' practical training had been completed, and a certificate had been obtained to that effect, as it would be rather hard on students who were unable to get a chance of such training, but if arrangements could be made for every student to get such a chance he would be in favour of the scheme. He had, however, been a Fellow of the Bombay University for 20 years, and from his experience of that body could say that they were not likely to accept the proposal outlined above. He thought it would be more feasible if, after the students had obtained their college degrees and completed their two years' practical training, a further degree or diploma were conferred by some private association with a charter on the lines of the Institution of Civil Engineers in London. He was doubtful, however, whether such an association, competent enough to confer a degree, could be instituted in Bombay, and whether, even if so instituted, its standing would be recognised.

588. The men he employed were generally taken direct from the college. These men joined the profession at a somewhat advanced age (very seldom under 25) considering that they had no previous practical training. The man from England had usually had three years' practical training by the time he came out. He was in favour of the proposal that the age for admission into the engineering colleges should be reduced so as not to make it necessary for students to pass the B. A. examination before entering such colleges; it would be much better if they passed out at 23 than at 25. He did not give much weight to the objection that if the proposal were adopted the educational standard of the students on entering the engineering colleges would be so low that they would be unable to follow the specialised courses of engineering, and thought that they were in general sufficiently intelligent to follow such lectures and that they had an adequate knowledge of English for the purpose. The Technical Institute, Bombay, admitted matriculates while the Poona College practically took only graduates.

589. (*Sir Noel Kershaw.*) The last two engineers engaged by the Port Trust from England had come out with degrees in engineering from Cambridge, had had three years' practical training and had worked as Assistant Engineers on works in England. One had been employed in the Enfield Small Arms Factory and the other on the Liverpool docks. The men whom the Port Trust obtained from England as engineers had always been in employment for a year or two and sometimes for three or four years as Assistant or Resident Engineers before coming out to India.

590. He admitted that, if an association could be formed for the whole of India which would grant diplomas or certificates to students to the effect that they had undergone a practical training in engineering, it would

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[Continued.]

have greater weight than the one already suggested which applied to Bombay alone.

591. He had not sufficient comparative experience of the students from the Poona College and the Technical Institute, Bombay, to form an opinion as to whether there was or was not* a great distinction between them as regards practical work.

592. (*Mr. Mackenzie.*) He had never compared the rates of the Port Trust with those of the Public Works Department but thought that there was very little difference between them.

593. (*Rai Bahadur Ganga Ram.*) The rate of Rs. 23 per thousand referred to in his statement (not printed) was for the best bricks delivered at the site of work, and the rate of Rs. 30 paid for lime concrete was for ordinary lime concrete only, not cement concrete.

* Mr. Messent afterwards wrote that he had seen Mr. C. Anderson, Mechanical Superintendent, Bombay Port Trust, who said that the men who came to the workshops from the Technical Institute were better trained in practical work than those who came from the Poona College, and that the foreman and *mistris* concurred in this view.

THE HON'BLE DEWAN BAHADUR K. R. GODBOLE, M.I.C.E., Executive Engineer (retired).

Written Statement.

598. (I.) **Economy and suitability of methods of execution of public works.**—The Public Works Department system is expensive for the execution of ordinary buildings and roads works in India. The Public Works Department establishment charges come to about 24 per cent. of the cost of works, and, including work-charged establishments, these charges will amount to about 30 per cent. of the cost of works. A cheaper system is desirable for the execution of ordinary roads and buildings works and their repairs, which do not require technical knowledge and supervision of a very high order. The present Public Works Department system, which was devised for early British rule days, is capable of modification now, in the interests of economy.

599. (II.) **Encouragement of other agency.**—Under the existing system there is little or no encouragement for private engineers and engineering firms. The cheaper agencies that can be brought in for the execution of ordinary roads and buildings and their repairs are (a) private engineers and engineering firms and (b) district board engineers that are under contemplation in this presidency.

(2.) The ordinary buildings and road works required in this presidency (*taluka katcheries*, sub-judges' courts, district bungalows, *dharamsalas*, rural schools, dispensaries, police lines, road drains, road culverts and small road bridges, etc.), have got type designs and standard plans and quantities already worked out for them. No designing is therefore required in such cases. All these works and their repairs and the repairs of roads and buildings generally might be handed over to district boards, who will execute them at about 10 per cent. of the estimated costs by their own engineering staff. A limit might be fixed as to the works to be handed over to the district boards. I would set this limit at Rs. 20,000 for each individual work. Large works and special works such as large buildings, suspension bridges, girder bridges, etc., which require high technical skill might be designed by, and executed under the supervision of, approved private engineers and engineering firms who should be paid percentages on costs as their remuneration. The percentages should vary between 5 and 10. District boards will also be at liberty to employ approved private engineers and engineering firms for the execution of board works.

(3.) The designing and construction of mills, factories, large schools, colleges, etc., by private engineers and engineering firms, at a remuneration of about 5 per cent. of the cost, are already in operation in this presidency. This system prevails in Bombay and its suburbs and is practised in Poona, Ahmedabad, Sholapur, etc. It might gradually be extended to other district towns

594. The cost of the establishment employed on works varied from year to year; it had been as low as 3 per cent. but, for many years, never more than 6 per cent. of the cost of the works. This included only his office accounts establishment and not the Chief Accountant, who was separate.

595. In regard to the big works executed by European firms, such firms required detailed supervision. The only advantage in employing skilled European contractors lay in the fact that they had the necessary plant and skilled establishment.

596. (*Mr. Cobb.*) There was a Stores Department in the Port Trust but no great quantity of stores was kept there. That department was supplied with a schedule of demands and called for tenders for the total amount each year. Everything possible was purchased in Bombay, but special stores such as cranes, etc., were obtained direct from England. The system of local purchase was quite satisfactory except at the present time on account of the war.

597. (*Mr. Kent.*) A certain proportion of the subordinate staff employed by the Port Trust was permanent, but all *mistris* were temporary.

and other places in the presidency. On the development of the above agencies, it will be practicable to contract the Roads and Buildings Branch of the Public Works Department to a considerable extent, after 12 or 15 years. This will lead to the abolition of several roads and buildings districts.

(4.) I would retain the present Superintending Engineer for professional supervision and advice as regards all public works in his circle. He should have a staff of qualified engineers and subordinates attached to his office for supervision of works and for the execution of special works, such as large buildings or sets of buildings and bridges which are beyond the capacities of district board engineers and private engineers or engineering firms. Such special works should be carried out as temporary executive charges which will last until the completion of the work or works concerned. All works carried out by local boards or otherwise, which can be measured and specified with exactitude, should be given out by contract to registered approved contractors or contracting firms, the contracts being for periods of 10 or 15 years in the case of road repairs and other annually recurring works, so that the contractors might make economic arrangements for the labour and materials required. All private engineers and contractors to be entrusted with the execution of public works must have professional training, and some of the partners of engineering firms and contractors' firms doing public works must also be men with professional training. This should be a condition of registration, and no work should be given to other than registered engineers, contractors and firms, the registers being kept in Superintending Engineer's offices. If the above procedure be gradually introduced cheaper agencies will become available for the execution of public works without loss of efficiency, and material encouragement will be given to the development of engineering training and private enterprise.

600. (III.) **Changes in organization.**—The class of sub-overseers with general training up to the matriculation standard, and professional training of three or four years in engineering, as given at present in the Poona College of Engineering, should be more extensively employed and trained on government works by the Public Works Department than at present. These men will be specially serviceable in the new contractors' and engineers' firms and in the engineering staffs of the district boards.

601. (IV.) **Relations with other departments and sub-branches.**—I think, in the case of roads and buildings, the engineer in charge should not be interfered with by any other engineer, except when he requires outside assistance himself. The Superintending Engineer can insist upon outside assistance being called in when he considers this course to be necessary.

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602. (VII.) Education.—I think accounts and book-keeping should find a place in the present engineering college courses. This will enable the students to be useful in business and on works earlier than they are at present.

603. (VIII.) Practical training.—The present visits of final year students of the College of Engineering at Poona to works in progress should be longer and their study of actual processes more thorough than at present. Engineers in charge of government and state-aided works,

railway and other workshop superintendents, and engineering and contractors' firms receiving government patronage, should be asked to give all practicable facilities to advanced students for gaining practical acquaintance with engineering practice. Two years' apprenticeship in a recognised engineer's or contractor's firm, after the completion of theoretical studies, will be a very great advantage, but unfortunately this cannot be insisted upon at present as there are very few firms in India where the apprenticeship can be served.

The HON'BLE DEWAN BAHADUR K. R. GODBOLE called and examined.

604. (President.) The witness stated that he retired from the Public Works Department in 1903 with the rank of Executive Engineer. Since that time he had taken up the construction of a few works, and had assisted in the promotion of two railway feeder lines. He had also been engaged on preliminary work in connection with railway feeder schemes.

605. He had not taken up regular private practice, but had constructed buildings and done other professional work at the request of certain associations who had pressed him to undertake the work, and had also done some work for the Tata Iron and Steel Works. This latter work he had undertaken, not as a contractor, but only as a consulting engineer.

606. The witness here remarked that he would like to make one or two statements in order to make his position clear, before the Committee proceeded with his examination. He stated that he wanted to draw attention to the heavy establishment charges of the Public Works Department. For instance, the Bombay provincial budget grant was about Rs. 100 lakhs per year. Out of this government spent about Rs. 30 lakhs in the way of establishment, and he had attempted to show in his written evidence that this charge of Rs. 30 lakhs could be reduced in certain ways which he had suggested.

607. He was of opinion that the Public Works Department was not economical because its establishment charges were too heavy for the class of work ordinarily carried out. These charges he put at about 24 per cent. It was here pointed out to him that the information supplied to the Committee by the Government of Bombay showed that the charges in the Buildings and Roads Branch for the last four years had been only about 15 per cent., i.e., the net cost of work had been about one crore of rupees (100 lakhs) and the cost of establishment had been about 15 lakhs. He then stated that he might be wrong, but remarked that he had prepared his figures from the budget statements that were supplied to him as a member of the Bombay Legislative Council.

608. The central idea which he had put forward in his memorandum was that district boards should employ their own engineering establishments not only for the construction of their own works, but also for the construction and maintenance of a large portion of minor government works costing less than Rs. 20,000 together with all road and other repairs. He had had experience of district boards in that he had, since his retirement, been a member of the Poona district local board for 5 or 6 years. Although in the Bombay Presidency district boards had, at present, no engineering staff of their own and the bulk of their work was carried out by the Public Works Department he thought that, if these boards had such a staff they would welcome the opportunity of being allowed to carry out their own works. He was of opinion that this change would be popular with the boards, and mentioned that the change was already in contemplation as the Local Boards Act of the Bombay Presidency was being re-modelled and the bill, in which a provision was being made for district boards to employ their own engineering establishment to carry out their works, would shortly come before the Bombay Legislative Council.

609. District boards at present generally employed *mistris* and sub-overseers, whom they placed in charge of *talukas*. These men carried out their works badly, as there was practically no professional supervision over them. This, he considered, accounted for the

tendency of district boards at the present time to transfer the maintenance of their works to the Public Works Department. He was also of opinion that minor government works should be constructed by district boards up to a limit of Rs. 20,000. He fixed this limit so that the works would be within the capacity of the type of engineer which the boards would necessarily employ. To meet the contention that the system he advocated would involve a duplication of staff in the district by there being two establishments, one maintained by the district board and the other by the Public Works Department, he proposed that, when the district board had its own establishment for minor works, the Public Works Department establishment should be gradually done away with. As major works would probably be few they could be otherwise arranged for, and a saving in establishment charges effected. He considered the substitution of a district board engineering staff for the present Public Works Department agency to be an advantage, because while the Public Works Department staff was very highly trained and therefore much more expensive than a district board staff of the nature he proposed would be, the latter would still be quite competent to carry out the average run of minor works now undertaken by the former. He stated, however, that there was a certain amount of duplication at present as the boards had a minor establishment for the execution of certain of their smaller works.

610. The funds at the disposal of some of the district boards were at present too small to justify the entertainment of a staff of their own sufficient to carry out public works. He was of opinion that this difficulty would be met if these boards were allowed to undertake, in addition to their own works, the minor government works he had suggested, and he believed that this would justify the entertainment of an engineering establishment for each district by its board. In the presidency of Bombay there was at present only one instance of an Executive Engineer's charge extending over more than one district, viz., the districts of Surat and Broach.

611. District works should be carried out by the increased employment of large contractors rather than by the petty piece-work system, as, although in the districts contractors were not at present available for the execution of work, he was of opinion that this difficulty would be removed if the contract system were encouraged. In the case of special works like road repairs requiring large quantities of metal annually a contract should be given out for a substantial number of years—ten or fifteen. This system would have no tendency to create monopolies because in each district there would usually be four or five different contracting firms who would compete with one another for the contracts. The advantage of this method would be that the contracting firm could employ special machinery and plant and appliances, and hence probably be able to do the works at less cost. He would not, however, give all the works in the district to one firm. He believed it would be quite possible to give out a contract for ten or fifteen years ahead, as the contractor could estimate his rates for the whole period if he were allowed to make his own arrangements for such items as metal and transport. Such a contractor would probably use his own stone-breaking machines and thus ensure a pretty constant rate for metal. He admitted in this connection that labour rates had increased in recent years, but considered that this difficulty could be got over by giving the con-

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tract to an influential man who would employ machinery and so gradually reduce the labour factor.

612. The main advantage of encouraging the employment of sub-overseers at the expense of *mistris* as suggested in his written evidence would be that the necessity for entertaining overseers would be obviated. Under the system at present in force the man in immediate charge of a work was the *mistri* while the setting out and planning were done by the overseer. Under his scheme the sub-overseer would be in charge of the work, and would thus do both the overseer's and *mistri's* work, i.e., he considered that the present establishment of overseers and *mistris* was unnecessary. He thought the converse proposal of encouraging the employment of *mistris* at the expense of sub-overseers, giving the former a better training and taking them on to the permanent Public Works Department establishment, should be discouraged. He considered it preferable to give a course of practical training to sub-overseers because, though *mistris* after training would probably be better guides in directing a work, he doubted whether they would make better supervising officers than sub-overseers since, when left to themselves, they were prone to dishonesty. If they were made permanent there would be the great disadvantage that when there were no works these *mistris* would have to be kept on although there was nothing for them to do, whereas sub-overseers, on the other hand, were capable of drawing up plans and schemes and of making designs of work which *mistris* could not attempt.

613. He expressed himself in favour of the proposal that all passed students of the Poona Engineering College should receive one or two years' practical training under the Public Works Department whether they ultimately entered that Department or not, but he was doubtful whether the scheme was practicable. Though he considered this system would afford an excellent training, he anticipated difficulties on the grounds that the number of large engineering works going on at one time in the province was generally limited, and that the staff who undertook the training of these students would not be able to find the necessary time. He admitted, however, that if the number of students undergoing training at any one time was limited to thirty there would be sufficient work in the Bombay Presidency to admit of that number being taken. The students, he thought, would welcome this course of training if they had not to bear all the expenses themselves, and if they were paid stipends or maintenance allowance during the period, i.e., were given a living wage. He suggested that this wage should be Rs. 50 a month, in spite of the fact that the men who would eventually enter the Public Works Department would start on only Rs. 60, since the nature of the training would make it necessary for them to shift from work to work. It was, however, possible that Rs. 30 would suffice.

614. He did not approve of the suggestion that the educational standard required for admission to the Poona Engineering College should be reduced to the matriculation so as to allow of the students undergoing two years' practical training after leaving college before they became too advanced in age, because, if men with a general education only up to the matriculation standard passed out from the college as engineers, they would not be able to maintain their social position in after life. This, he considered, would be a great disadvantage. He was in favour of a certain amount of general education being given before the engineering course. It would not be feasible, he thought, to give men with a matriculation standard of education a course of general education in such subjects as English and mathematics in addition to their actual specialized engineering courses while in the college, because for this general education it was necessary that students should be in touch with professors of the right type. This could, he thought, be better given in an Arts college. His attention was drawn to the fact that the Victoria Jubilee Technical Institute in Bombay trained men in special engineering work and required for admission only an educational qualification such as the school final or matriculation, to which he replied that he had come across men who

had passed out of that institute whose standard of education, being much lower than that of the engineering B.E.s. of Poona, had placed them at a great disadvantage in after life. He admitted that engineers when they passed out from Poona were not good practical men, but added that those who obtained appointments in the Public Works Department became useful after a couple of years, while those who took up work with private firms had usually to gain their experience at the expense of their employers.

615. (*Mr. Cobb.*) He thought that the practical course of training should be given to students after they had completed their theoretical course of education. It would be difficult to carry out in practice the system of having a practical course sandwiched into the theoretical course, as there would be a liability on the part of the students to forget during their practical training what theory they had already learnt. Students passing the matriculation at about the age of seventeen should go to an Arts college for one year for their general education and then enter the engineering college. This, he considered, would do away with the age difficulty.

616. (*Rai Bahadur Ganga Ram.*) The local board engineers suggested in his scheme would be on a common cadre, and be placed under the control of the Superintending Engineer. The service should be a pensionable one, pensions being given by the local boards. The details of the scheme would, however, have to be worked out. Personally he had little preference whether pensions were introduced or a provident fund system instituted, but in general officers in government service preferred pensions.

617. Although the Port Trust were willing to undertake government work with an establishment charge of 5 per cent., he thought that when works were made over to local boards under his scheme the cost of establishment allowed should be 10 or 12 per cent. He explained that at present the Public Works Department incurred a cost in this respect of 20 per cent., that Department wasting a lot of time in projects which never came to anything. He did not think that any amount less than 10 per cent. would pay a local board in the case of minor works.

618. He considered that contracts should be given out for a longer period than five years in order to enable contractors to invest in special machinery, as the cost of labour in the Bombay Presidency was rising, and unless machinery was introduced the difficulty would become still more acute. Even at present it paid to use machinery if the quantities of work to be carried out were large.

619. He had never held an appointment as Executive Engineer in the presidency town, but had served only in the *majrissi*, where he had been in charge of both buildings and roads and irrigation works. He had had no necessity to compare the rates in these two branches of the Department but they were usually about the same.

620. With regard to the training of *mistris* and sub-overseers, he considered that a sub-overseer with extra training would make a much more useful man than a *mistri* in the same circumstances. He was of opinion that *mistris* should not be encouraged to learn levelling, surveying, etc., because although in some cases a *mistri* could not be dispensed with, he had found by experience that it was impossible to train such a man for higher work. Such men only commenced to learn at the age of 40 or 50.

621. (*Mr. Mackenzie.*) All works that could be measured and accurately specified should be given out on contract, and the private engineers and contractors who were entrusted with the execution of public works should be professionally trained men. He admitted that there were no such men at present, but this professional training should be made a condition of permission to undertake or tender for works. He would encourage trained contractors by giving them preference, so that in time existing contracting firms would take in trained men as their partners. There were at present some contractors of this stamp who got works. He cited the case of a railway contractor who had had his

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sons and nephews trained as B.Es. and stated that the sons and nephews were of great help on works. This contractor with his sons and nephews got a good deal of railway work and were always in demand. There were also a few other men who had trained engineers on their establishment. A previous professional training should be encouraged as far as possible; for example if two contractors offered to do a certain work the Executive Engineer should give preference to the firm with a partner who had this training. This he thought would start the ball rolling and lead other contracting firms to take into their establishments professionally-trained men. Executive Engineers, however, were sometimes very chary in giving contracts to men who knew too much. He knew from experience that it was very difficult to settle the final bills of such contractors, as the extras often claimed by them were extortionate and made the engineer's life a burden to him.

622. Machines could compete successfully with labour as regards expense where there was a large mass of work to be done and a large quantity of metal to be broken, even though the average daily wage of a cooli in the Bombay Presidency was about six annas. The whole question, however, depended on the quantity of metal to be broken. He had had practical experience of such machines and was sure that if there were enough work to engage a machine all the year through it would be more economical to use one.

623. (*Mr. Kent.*) For the convenience of contractors and in order to facilitate the use of their stone-breaking machines, he would give each of his contractors only a small concentrated piece of work at a time; for instance in Poona he would give out a contract for roads in the cantonment and roads in the suburbs within a radius of five miles of Poona city. He admitted that this would amount to throwing on the Public Works Department the responsibility for additional work in the district.

624. (*Mr. Mackenzie.*) He was of opinion that the right stamp of man would not be procured for a local fund establishment if he was engaged for only a short term of years under a provident fund scheme, since the candidates for short-term appointments were invariably inferior to the class who entered government and other services where their tenure was secure. Though permanent men were the exception in Europe, his experience was that in a backward country like India where conditions were different every man tried to get a post where his bread was assured for the whole of his working life.

625. The Public Works Department at present did a lot of useless work which was all charged to work that was useful. This wanted looking into. He cited the case of a bridge the plans and estimates of which had taken twenty-five years to prepare and had had to be done over again just as the bridge was about to be constructed. This involved a very considerable waste of paper, besides which, as the bridge had to be designed some seven or eight times, the Executive Engineer must have wasted a lot of his own time.

626. He admitted that in the case of the preparation of big projects such as a large ghaut road or a series of secretariat buildings there was no corresponding expenditure on works to show and hence the percentage cost of establishment for the district would look very much worse than if really was compared with that of a private agency such as a municipality, but he was of opinion that after making all allowances the Public Works Department system was much more expensive than that of utilizing private agencies. He added that, in Bombay, the cost of establishment on buildings carried out by the Public Works Department far exceeded that on similar buildings constructed by private firms.

627. (*Sir Noel Kershaw.*) The average annual cost of works constructed at present by the district board of Poona was roughly about Rs. 1,00,000. If under the scheme suggested by him certain Public Works Department works were transferred to the district board he thought that the following establishment would suffice. For carrying out minor works, such as road repairs and the construction of smaller buildings, a college-trained engineer, taken in the first instance from the Public

Works Department, would be employed on a salary of Rs. 250 to start with and be allowed to rise to a maximum pay of Rs. 500. The district being divided into a certain number of *talukas*, each *taluka* would have an overseer in charge of it, and the engineer would supervise the whole district. At present in each ordinary Public Works Department district there was an Executive Engineer, an Assistant Engineer, seven or eight upper and lower subordinates, some *mistris* and road inspectors and a staff of clerks and an accountant.

628. If works to the extent of Rs. 3,00,000 were given to each district board the sum which the board would have available for establishment at 10 per cent. would be Rs. 30,000 a year or Rs. 2,500 a month. This amount he considered would certainly enable them to maintain the requisite establishment and he felt confident that the saving thus effected would be the difference between this 10 per cent. establishment charge and the present Public Works Department charge of 25 per cent. His attention was again drawn to the fact that the Public Works Department establishment charges were not 25 per cent. but only 15 per cent.

629. Although he was not aware of the details of the present course given at the Poona Engineering College he considered that the theoretical education was higher than was necessary, and that some of the subjects such as higher mathematics, integral calculus, optics and astronomy should be omitted, as upper subordinates had no use for them. Instruction in mathematics should stop at trigonometry. More time would then be available for the practical training of the students, who would then leave college a little earlier in life. He added, with reference to the contention that it was not possible to tell at an early stage of a man's college career whether he was going to be an upper subordinate or an engineer, that a scheme was being formulated in the Poona College by which this difficulty would be removed.

630. (*Mr. Kent.*) Districts in the Bombay Presidency had no organized local fund engineering establishments at present. There were, however, establishments consisting of local fund overseers, sub-overseers, and their staffs. He was not able to give the percentage that the cost of these district board establishments bore to the total cost of works constructed by them but mentioned that, although he was doubtful as to the actual figures, in the case of one *taluka* board the expenditure on works was Rs. 8,000 and the men employed on construction were one sub-overseer, one clerk, and one peon, whose salaries amounted to Rs. 85 a month—a little over 12 per cent. In the majority of cases the sub-overseer in each *taluka* drew from Rs. 40 to Rs. 60 on the average. On being informed that the cost of establishments under local boards worked out to about 9½ per cent. of the total cost of works constructed by these establishments, he replied that this was lighter than it should be because the quantity of work given to such a board at present was too small and ought to be increased. He added that the cost of the establishment suggested in his scheme would bring this percentage up to 12 or 15 per cent. 15 per cent. on the cost of works might, he suggested, be taken as a standard. He admitted that this staff would be inferior technically to the present Public Works Department agency, but it would be efficient enough for the nature of the work it would be employed on. It would be subject throughout to the control of the Superintending Engineer.

631. Although it would be cheaper it was not desirable at present to give out works to architectural firms in Bombay instead of employing a Government Architect. When well-established architects of the right stamp were forthcoming, he thought it would be time enough to abolish the Government Architect. He expressed surprise on being informed that figures had been worked out for the last six years showing the actual work done in the Consulting Architect's office, the cost of the works executed, the cost of the preparation of plans, and what the fees at the rates laid down by the Institute of British Architects would have been had such works been entrusted to private agency and that it had been found

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that the cost was exactly half of what it would have been had private agency taken up the construction.

632. He admitted that the Indian sub-overseers at present employed by the Public Works Department were not efficient in the use of their hands, and were not able to explain or show the unskilled mechanic how work should be done, but thought that Indians were improving in these respects. He remarked, with reference to the suggestion that Indian sub-overseers after leaving school should go through a couple of years' practical training on a railway or in shops such as the Victoria Jubilee Technical Institute, before they entered upon their engineering college theoretical course, that he thought it would be better if the two courses were made to run concurrently. This was possible now so far as the Poona College of Science was concerned, as he had heard that all the sub-overseer class in that institution were now made to work in a workshop attached to the college for a few hours a day.

633. In the majority of executive districts in the Deccan the number of major works going on at any particular time was very small. He considered that a work should be classed as a major work if it cost above Rs. 20,000. District boards would, he thought, accept a scheme of district fund engineers borne on a common cadre with a lower-paid basis in one district and a higher-paid basis in another, for which the district boards would have to meet the cost, but over which they would have,

for practical purposes, very little control, if provincial works were handed over to this establishment to construct. There would be difficulties in some cases. Some local boards would object to pay high for their engineers, and would prefer to select their own men, rather than to have a man taken from a common cadre and posted to their district. Appointments should be made subject to the approval of the Superintending Engineer, who would see that the man was properly qualified and that no undue influence had been exercised in his appointment.

634. (Mr. Mackenzie.) The Madras system of having local fund engineers in entire charge of all roads except a few ghaut roads might be applied to Bombay, and he was of opinion that this system was suitable for ordinary road works. Under it there were various classes of district board engineers who were not on a common cadre and were not transferred from one district to the other unless a vacancy occurred in a senior class. The districts were divided into three classes—first, second and third, and if a vacancy occurred in the first-class a man from the second-class was appointed to fill it. The appointments of these local fund engineers were in the hands of government. He considered, however, that in Bombay appointments of this nature should be made by the boards subject to the approval of the Superintending Engineer.

At Bombay, Monday, 15th January 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

C. S. COBB, Esq., M.V.O.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

R. J. KENT, Esq., Chief Engineer and Secretary to Government, Bombay.

D. G. HARRIS, Esq. (*Secretary*).

W. A. CHAMBERS, Esq., F.R.I.B.A., Partner, Messrs. Chambers and Fritchley, Architects and Civil Engineers, Bombay.

Written Statement.

635. (II.) Encouragement of other agency.—I am of opinion that private enterprise is not encouraged by the present system of the administration of the Public Works Department, and I think it desirable to entrust the designing and supervision of the construction of buildings to another agency than departmental. The designing and supervision of public buildings in England are generally entrusted to architects in private practice. As instances within my own knowledge I mention the new Admiralty offices and the offices of the London County Council. Architects of position are asked to prepare designs, the designs are submitted to a committee of experts or qualified assessors and the work is given to the successful competitor. A system of this kind would encourage architects in India and would give a status to their profession which at present it lacks.

(2). The competition should be conducted in accordance with the conditions drawn up by the Royal Institute of British Architects. These conditions are roughly as follows :—

In every competition one or more fully-qualified professional assessors should be appointed to whom the whole of the designs should be submitted. No promoter of a competition and no assessor engaged upon it, or any employee of either, should compete or assist a competitor,

or act as architect or joint-architect for the work. Each design should be accompanied by a declaration, signed by the competitor or joint competitors, stating that the design is his or their own personal work, and that the drawings have been prepared under his or their own supervision. Premiums should be paid in accordance with the assessor's award, and the author of the design placed first by the assessor should be employed to carry out the work, unless the assessor is satisfied that there is some valid objection to such employment, in which case the author of the design placed next in order of merit should be employed, subject to a similar condition. The award of the assessor should not be set aside for any other reason, and the selected architect should be paid in accordance with the schedule of charges sanctioned and published by the Royal Institute of British Architects. The competitions should be announced by advertisement, inviting architects willing to compete for the intended work to send in their names with such information as they may think likely to advance their claim to be admitted to the competition. From these names the promoters, with the advice of the assessor, should select a limited number to compete, and each competitor thus selected should receive a specified sum for the preparation of his design; or by personal invitation to a limited number of selected architects.

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(3). An architect having been chosen he should be permitted to engage a contractor in whom he has confidence and the agreement under which the structure is to be erected should contain a clause which will make the architect master on his own building. The clause should be something like this: "In the event of any question or dispute arising between the building-owner or the architect and the contractor as to the intent and meaning of the specification, or of the drawings, or as to the intent and meaning of any part of the tender, or as to the manner of executing the works, or the quality or description of the materials, implements or plant used in the works, or as to the mode of measuring the works, or payment, or as to the interpretation, meaning or effect of the contract, or as to any other matter whatsoever connected with the contract, such questions or disputes shall from time to time, as they occur, be settled by the architect, whose decision shall be final and binding on all parties." Under the system I suggest the best design would be obtained, a competent contractor would be employed and the architect would not be obstructed in the execution of his work.

(4). In my opinion architectural work should be done cheaper by private enterprise than by the Public Works Department, because the establishment of an architect, I imagine, must be less expensive than that of a public department. To test this opinion I give the cost of the designing and supervision of four buildings erected under my supervision; the first two are in Bombay and the last two are in a suburb of Bombay.

	Rs.
(1) Cost	2,53,692
Architect's fees and <i>mistri's</i> wages	14,500
(2) Cost	49,973
Architect's fees and <i>mistri's</i> wages	3,279
(3) Cost	35,142
Architect's fees and <i>mistri's</i> wages	2,477

	Rs.
(4) Cost	43,930
Architect's fees and <i>mistri's</i> wages	3,016

(5). As a further test I submit building rates (not printed) at which a structure was erected by me in Bombay in the year 1915-16.

636. (VII). Education.—Technical education in India should be broadened. The men now practising in India as architects have been trained more as civil engineers than as architects—the result being that the designing of buildings has not been their chief concern. There are signs however that this defect is disappearing. A number of juniors are coming to the fore in Bombay who have been trained in England and who have won the degree of Associate of the Royal Institute of British Architects. The work of these men is very promising and with experience they will make successful architects. Indians have won distinction in the professions of law and medicine, and so far as I can see they should be as distinguished in the profession of architecture. A training, with an examination, similar to that of the Architectural Association of London should be added to the instruction existing in India and the education necessary to make an architect would then be obtained here. The government might also establish a few architectural scholarships to enable the brilliant men to continue their training in Europe or America.

637. (General.) For many years I was on the board of a Bombay suburban municipality, and for some years I was chairman of the Building Committee of that body. We found that our finances would not permit of us employing professional help of sufficient experience, and it has often struck me that if a number of small municipalities or boards could be joined the financial difficulty of obtaining competent technical advice would disappear. I submit this suggestion to the consideration of the Committee.

MR. W. A. CHAMBERS called and examined.

638. (President.) The witness stated that he had been practising privately as an architect in Bombay for twenty years. In addition to designing works he also supervised their construction.

639. There was an association of architects in Bombay which consisted of about sixty members. All licensed surveyors practising in Bombay were members of it. He did not come to give evidence as a representative of that association and had not even talked the matter over with that body; he was speaking entirely on his own behalf. Under the Municipal Act any person who held a license (and every L.C.E. was entitled to hold such a license) could practise as an architect in Bombay. There were about sixty licensed architects in the city but the majority of them were really architect engineers, and there were only two English firms and three or four Indian firms which could be considered as fully-qualified architects according to English ideas.

640. He employed no civil engineer on his staff. When he undertook the construction of a building his practice was to appoint to the work a surveyor paid by himself and a *mistri* paid by the owner. He gave a certificate, however, as to the wages due to this *mistri*. There were about a dozen such *mistris* whose livelihood depended on him, and who were paid by the person engaging the witness as architect.

641. After plans and estimates had been prepared the contract for construction was drawn up between the contractor and the owner of the building. The architect was mentioned in the contract, and acted as arbitrator in case of dispute. The fee permissible under the rules of the Royal Institute of British Architects amounted to 5 per cent. on the amount of the contract. This 5 per cent., which was calculated on the final bill of cost, included both the designing of the building and the supervising of its construction, but was not intended to include quantity surveys as in England where quantity surveyors formed a distinct branch of the profession. In Bombay, however, the architect himself supplied quantities, getting

nothing extra for it, so this charge was also included in the 5 per cent.

642. With regard to the responsibility of the architect for the structural stability of his buildings the law laid down that, if an architect certified a building to be correctly built and if after a certain number of years it was discovered to be defective, the primary responsibility rested with the contractor, but the witness believed that the owner could take action against the architect if the work and materials had been passed by him.

643. He was of opinion that the post of Government Architect should be abolished and that the architectural work required by government should be thrown open to public competition among private firms. He admitted that there were not many such firms in Bombay who would, at present, be capable of competing, but he believed that, given the necessary training, such firms would be forthcoming as soon as a demand for them arose. Under existing conditions private architects did not get the best buildings, and were shut out of government work. If the system of competition suggested in his written evidence were introduced, on the plan of the competitions conducted under the regulations of the Royal Institute of British Architects, where the owner of the building paid for the cost of the preparation of designs by the competitors, government would have to give a fee for the preparation of each competitive design. He did not know what fee was laid down by the Institute but thought that it covered the cost of paper, etc., and ensured that the competitor was paid for his labour. It was a long time since he had been in England, but he believed that a fee of about Rs. 500 would be sufficient to cover the cost of each set of drawings. The decision as between competitors would rest with a professional assessor, who might be the Government Architect. He explained that the suggestion made in his written evidence that this officer should be abolished was intended only to imply that the Consulting Architect to Government should not be a

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practising architect, but he thought that there would be no harm in that officer's retention as a consulting architect pure and simple. He did not think that there was any objection to the criticism of designs prepared by others by a man who made no designs himself, provided that the latter was competent and had sufficient experience. That in fact was the type of work upon which the witness was largely engaged at present.

644. He was of opinion that a clause should be entered in all contracts making the architect sole master on the building as otherwise his position would be intolerable, as it would not do to have another supervising staff interfering with the actual construction of the work. That was the practice followed in the case of private work and the clause was in accordance with the rules of the Royal Institute of British Architects.

645. He did not know what it cost government to design and supervise a building. He had, however, given figures to show what it cost others to employ him so that a comparison might be made. On being informed of the fact that the Government Architect had supplied certain figures showing that the cost of his establishment was considerably less than 5 per cent, the witness admitted that as a business man he would not in the circumstances advocate his scheme. He thought, however, that it would be wise for government to encourage the people of this country to take up the profession of architecture. He admitted that the figures quoted by him showed that the cost of employing him occasionally exceeded 5 per cent. In the case of a hospital at Bandara, for example, the cost of which was Rs. 43,930, his charges were Rs. 3,016, i.e., about 7 per cent. This variation, he explained, was caused by difference in *mistris'* wages, some buildings taking a longer time to construct than others.

646. His scheme was intended to apply to big cities only and not to the *mofussil* of which he had had no experience at all. He thought that there was sufficient work in Bombay city to make it worth while for architects of standing to come and set up in private practice. There were one or two large buildings in Bombay at present which private architects would be very pleased to get. If it were known that government were throwing open works of this nature a considerable number of men would come out from England, and Indians also would qualify themselves for such work. He did not consider that the amount of government work in Bombay would be small as compared with private work seeing that at the present time there were the Customs House, the Freeman Thomas Hospital, and a large hospital at Poona all under construction, any of which was sufficiently big to tempt an architect to put himself to a little trouble to obtain it.

647. Private bodies in Bombay employed private architects. The Bombay Corporation had employed the witness largely in the valuation of land. When they built the municipal offices they engaged a private architect, and the Great Indian Peninsula Railway employed his own firm for the construction of the annexe to the Victoria Terminus. They had, however, now brought out a man from home, but he believed that they were making a mistake. The Improvement Trust also employed their own architect, but that body built their offices under the system which he had suggested. The Port Trust also had employed his firm and still, he believed, employed private architects. The committee of the King Edward Hospital, however, had employed the Consulting Architect to the Government of Bombay for the preparation of the design of that building, as they had an idea that the Government Architect would be more competent than a private practitioner. This idea, he considered, was erroneous.

648. His firm had hitherto refused to enter into public competition with other architectural firms, as there was usually no professional assessor. If there were such an assessor he thought that his firm would be glad to compete. In that case it would not make much difference to architectural firms whether junior firms competed with them or not. He did not think it was quite correct to say that architectural firms of

standing in Great Britain invariably declined to enter into competition. On the contrary, there was a great desire on the part of firms of standing to compete unless they had reason to believe either that the competition was not a fair one, or that personal motives might influence the committee. He admitted that it would be unpleasant to be beaten by a junior but was willing to take the risk if a professional assessor were appointed. As a man who was used to looking at drawings he would distinguish at once between the work of an experienced man and that of a junior; the difficulty in regard to construction would be easily overcome, as it was in the case of the London County offices which formed the subject of a world-wide competition which was won by a junior man. The Council gave him the work, but appointed their own engineer to carry out the construction with him.

649. He was not sufficiently acquainted with the Bombay School of Art to give any opinion as to the work done there. He had been to that school occasionally and considered that some of the work done there was distinctly good. The witness was in favour of a college for the training of architects but suggested that, instead of the college being located in Bombay, it should form a part of the engineering college at Poona. The man who showed aptitude for designing might thus be given architectural training in addition to his engineering course. He did not want a completely separate course for architects, but considered that the moment a man showed any sign of being a designer, as distinct from an engineer, he should be encouraged to take up the architectural branch. The right line of advance, he thought, would be for all the men to take the civil engineer's course for a limited number of years, and then for some of the students to be given a specialized course in architecture.

650. He had been trained in connection with Kensington Schools, and had passed his examinations in building construction and designing. He then entered an architect's office as pupil for three or four years before coming out to India. He doubted the efficacy of an examination as a real test, and hence suggested that before any man went up for his examination he should be given a practical training in an engineer's or an architect's office. His impression was that no man was allowed to compete for an examination under the Royal Institute of British Architects unless he had served a pupilage in an architect's office, and great value was attached to this pre-examination training. He thought it was absolutely essential that a man should have such practical training. The way to encourage it was for government to lay down that before a man started work he must have been trained in the office of a qualified architect as pupil or assistant. Personally, he did not like taking pupils, but his experience of his own head assistant, who had been a pupil under him, led him to think that the system of pupilage might be a good one. It would be feasible to carry out this suggestion if it were laid down as a condition of passing the examination that previous training with an architect's firm was essential. The students should pay a premium for their training as was the practice in England. He did not agree that they were so poor as to be unable to pay, and instanced the case of a Parsee who had had to spend about Rs. 20,000 to get such training in England as it was unavailable in India. On the whole he believed that the scheme would be practicable if it were laid down that before getting their diploma students must undergo a period of one year's practical training with a firm of architects. He believed that architects would be only too pleased to give such training and students only too pleased to accept it; he received many applications for training at present and applicants had offered to pay premia, but he had hitherto not desired to burden his office with them. If, however, it were known that this was the only method by which these men could be trained, architects who were anxious to see the profession progressing would take them in.

651. He had been chairman of the Public Works Committee of the Bandara Municipality for many years. That municipality had occasionally had big schemes to

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carry out but had been unable to afford to pay for the necessary professional advice. He instanced the case of a reservoir for the water-supply of Bandara where the municipality had been unable to obtain professional advice and expressed his belief that, if two or three municipalities in the vicinity had joined to share the expenses, the scheme would have matured and all the municipalities joining would have benefitted. He did not think it would be advantageous for government to employ a whole-time professional adviser to give advice to municipalities on schemes of that nature.

652. (*Sir Noel Kershaw.*) In view of the fact that there were many contractors in Bombay who would be ready to tender for an architect's work, and in whom architects would have confidence, he had suggested in his written memorandum that, after the architect was chosen, he should be authorized to engage a contractor for the whole building.

653. With regard to the competition suggested by him he did not think that professional assessors would form cliques which would try to run down experienced architects and support new men who were their inferiors. Architects had faith in each other. He admitted that in England several leading architects refused to compete against one another, but thought that architects in India should be given a chance of showing what they were worth. A competition between architects had been held for the Houses of Parliament, and an architect who was previously unknown became famous when he designed the Royal Courts of Justice.

654. Contractors in England were bound by law to sign a form of contract in which the architect was named as the final arbiter. He was not aware of any instance in which contractors objected to this. In the competition suggested by him a limiting price for the building to be designed would be entered on the form, as was generally done in England, but the architect's fee would be calculated on the actual cost of the building. He did not think that it had been found a common experience in competitions in England that the cost of the building designed was out of all proportion to the limit fixed in the competition. The competitive system was almost universally practised in England, and professional papers like the 'Building News' and 'Builder' had columns devoted every week to such competitions. It had not been his experience that such competitions led to grave over-estimating, but he was unable to speak definitely on the matter as he had been in India for about thirty years and had been only a junior when he left England.

655. (*Mr. Mackenzie.*) The clause in the contract form stating that an architect should be the final arbiter applied, he thought, to engineering as well as architectural contracts. He had heard the argument that it was rather unreasonable to make an architect arbiter on what was virtually his own contract, but it was the universal practice. The architect was in a very difficult position, he was paid by the owner, and yet had sometimes to give decisions against the latter. The qualities, therefore, required in an architect were uprightness, honesty and impartiality. If a case of this nature were taken to court he did not think that a judge would hold the clause unreasonable, unless the contractor could show that the architect was in collusion with the owner. For example, in the case of a building contract where a dispute had arisen and the architect's certificate was criticised by the builder, the matter had been referred to the witness to decide whether the architect's decision should be upheld or not. He had had the advantage of the opinions of solicitors and counsel, and had heard one solicitor argue that even if the architect's certificate were wrong the law laid down that the architect's decision must be followed. This impressed him very much, as the solicitor quoted cases in support of it. He admitted that a clause appointing the architect arbiter might appear to be unfair, but it prevented a lot of unnecessary disputes. He had had a large experience of legal matters in India and was able to assure the Committee that so long as the architect was not proved to be corrupt the clause was upheld.

656. His suggestion that architects should take up the supervision of the construction of buildings as well as their design applied to cities only and not to the districts, as all his experience had been confined to the larger towns. There was very little work of a suitable nature in the districts, although there were a large number of small buildings which accounted for a good deal of expenditure. He believed either that designs for these were prepared by the Government Architect or that type designs were followed. There was therefore no field for private practice in the districts. If a private architect were asked to supervise the construction of a building designed by another he thought he would agree to do it.

657. The rates he had submitted in his written evidence for 1915-16 were arrived at as follows. He first prepared a schedule in which he entered the quantities and such rates as he considered fair. The contractors were then asked to compete; they were not allowed to alter the rates in the schedule, but the one who gave the largest discount got the work. He added that although he could not say how far it was true, there was an impression abroad that government were too exacting in their work, and he believed that it was on this account that private architects got better rates. He instanced the case of a surveyor who had left his service to take up government work as a contractor, but who had given it up because he found that government were too exacting. He did not think people were apt to be careless with government money, his experience being that government were just as keen about cutting fees as anybody else, and that they scrutinized their bills very closely. They were as economical as private agency in that respect. He could not say whether his rates were less than government rates as he had not had government rates to compare with them.

658. (*Rai Bahadur Ganga Ram.*) There were four English-qualified Indian firms of standing in Bombay. Some had no English qualifications, but all had Indian qualifications and were experienced men.

659. He would have no objection to taking up a work even if he was asked only to prepare a design and not to superintend the construction.

660. He was not able to say whether, if the Government Architect were limited to consulting work and all other government work were given to private architects, it would be more economical, but he thought that, as government were owners of large properties and required the advice of an architect, they should pay for that advice either in the form of a consulting architect or a private one. He cited a similar case of a Government Architect in England and remarked that as government employed private architects for the erection of their buildings, the officer referred to must have sufficient consulting work to do as otherwise he would hardly be retained in the post. His fees for consultation were Rs. 30 an hour, which was charged according to the time spent on the work. A large proportion of his clients were solicitors. His contracts were based on the forms of the Institute of British Architects and were drawn up by him. A lawyer was not consulted.

661. When stating in his written evidence that the rate for brickwork was Rs. 38 per hundred cubic feet, he had calculated it on the current rate for bricks of Rs. 22 per thousand delivered on the works, allowing 1,300 bricks per hundred cubic feet of masonry. He did not know the current rate for bricks at kiln site. The bricks he had referred to were "Billimoria" bricks, which were the best obtainable in Bombay. Besides these there were *Matunga* and *Kalyan* bricks, of which the latter was of a better type than the former.

662. He considered that special training in architecture should be given to students before they entered college, and was willing to train such students in his own firm.

663. He revised his own rates very frequently owing to the rise and fall in wages and prices of materials.

664. (*Mr. Cobb.*) His impression was that there was a general tendency for public bodies in England to employ outside architects for their designs, as in the case of the

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[Continued.]

County Hall to which he had referred. He admitted, however, that this was an exceptionally large building and that public bodies employed their own architects as consulting architects.

665. With reference to the remark that government were too exacting, he stated that architects would be prepared to deal with government in the same way as they had to deal with other difficult clients, and that personally he did not think that government would be more difficult to deal with than certain other clients of whom he had had experience. It would, of course, depend to some extent on the personality of the government engineer. If any private client wanted him to make changes in a design after acceptance he would certainly do so provided it were not a structural change. It would not do for him to have the reputation of being a man who never listened to his clients, but on the other hand he would not allow unnecessary interference on the part of his clients. His remarks as to government being too exacting were based on what he had heard from contractors and not from architects. It was not his personal experience.

666. He considered that the system adopted by government for the execution of repairs to buildings was suitable and as the works were of a petty nature he did not recommend any change.

667. (*President.*) Under his scheme, government would maintain a Consulting Architect only, and there would be no necessity for the employment of other superior establishment on buildings made over to private architects. A subordinate Public Works Department staff, to supervise repairs, would alone be required. He instanced the case of the High Court in Bombay, repairs to which were done at present by the Public Works Department engineers and never by an architect. The government engineer could, however, not be abolished entirely as he would still have roads to attend to. The subordinate Public Works staff that at present constructed buildings would do the same work but under the orders of the private architect who would be engaged.

668. (*Mr. Kent.*) He considered that, if the Consulting Architect's appointment were abolished as proposed by him, it would lead to substantial additions to the work of the private architects in Bombay. He did not suggest that one firm of architects should get the whole of the government work; each would get a portion of it, doing the private work they were now doing in addition. He admitted that the number of qualified architectural firms capable of undertaking government work was small, but did not agree that this would lead to the work being centered in one or two firms, for if government changed its policy and created a demand for qualified architects, and if some regular system of education were adopted, a better class of qualified men would at once become

available. At present, when all the plums were kept away from the private practitioner, there was no encouragement for men to train themselves in the profession.

669. Under his scheme for the training of architects much would depend on the professor, who would have to decide which boys showed aptitude for designing, and select them for architectural training. His scheme was based on the principle that a man coming in touch with students was capable of judging the trend of their inclinations. As to the length of time required to turn out a good architect he believed that the accepted principle in England was that a man must be in an office for three years and that some were there for four. He believed that the Institute of British Architects had laid down that no one should compete for an examination unless he had been articled to a firm for three years or had been an assistant in an office for seven years. He admitted that under his scheme a young man aspiring to be an architect would have to start with a firm in Bombay, get articled there, and then go to a college of engineering and undergo a three years' course of training there, but he did not think that this would result in the production of a hybrid type of architect engineer. The trouble was that at present a man, having passed his examination, got his L.C.E. and opened an office at once. This was as fatal a case as that of a doctor starting practice immediately after passing his examinations, and would be avoided if his scheme were adopted.

670. He considered that it would be desirable to conduct the training of architects in Poona, as there was already a college of engineering in existence there. He admitted that Bombay afforded greater facilities, in its surroundings, for architectural education and that he had mentioned Poona only because there was a college there already. He would have no objection to the institution of a college in Bombay. He had not sufficient knowledge of the Bombay School of Art to be able to give an opinion as to whether, if a school for architects were opened, it should or should not be attached to that school. He believed that the staff of the school was fully qualified.

671. The statement put in by the Consulting Architect to Government compared his charges with those of private architects, calculated at 7½ per cent. He explained that this included the 5 per cent. allowed by the Institute of British Architects and 2½ per cent. paid to the quantity surveyors, but added that it was, unfortunately, not the custom in Bombay to charge for the preparation of quantities separately. This had to be done within the 5 per cent., so that to compare a private architect's fee with those of the Consulting Architect to Government 2½ per cent. should be taken for drawings, and 2½ per cent. for the architect's supervision, to this being added the *mistris'* wages. He generally paid Rs. 50 to 100 a month to his *mistris*.

G. T. MAWSON, Esq., M.SOC. C.E., M.C.I., General Manager, Messrs. Marsland, Price & Co., Ltd., Bombay.

Written Statement.

672. (I.) **Economy and suitability of methods of execution of public works.**—I think the methods at present adopted for the execution of civil works are economical and suitable for the purposes for which they are devised.

673. (II.) **Encouragement of other agency.**—Private enterprise is generally encouraged, but more support could be given. The construction and upkeep of public

works compares very favourably with the construction and upkeep of other classes of buildings, public and private, in this country, and the existing arrangement could not, I think, be improved.

674. (VII.) **Education.**—My firm have tried several graduates of the Poona Engineering College, but have so far been unsuccessful in obtaining a suitable civil engineer from this institution. They therefore find it necessary to engage Europeans in England to design and supervise their work.

MR. G. T. MAWSON called and examined.

675. (*President.*) The witness stated that he was the representative of the firm of Messrs. Marsland, Price and Co., Ltd.

676. The chief work undertaken by the firm was reinforced concrete, in which they were specialists, but they also undertook steel, sanitary and general building work. The firm employed their own permanent engineering staff, but not a permanent staff of architects, as they had not sufficient architectural work to render such a measure

necessary. Work was undertaken by the firm for private persons and in the case of buildings the firm usually supplied full plans and designs.

677. Private enterprise was generally encouraged by the Public Works Department, although more support might be given if all work were let out on contract, instead of being done departmentally, and if the present restrictions on the purchase of European stores were removed. He would advocate a system under which

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all public works would be given out to large contracting firms in preference to the employment of petty contractors or piece-workers. The latter system, he explained, entailed giving the masonry work to one petty contractor, the brickwork to another and so on; whereas if one large contracting firm were employed, all the different petty-contractors at present engaged on a single building would disappear and it would be constructed both quicker and cheaper and generally prove more satisfactory. His reason for believing that it would be cheaper was that under the present system each petty contractor employed got only a small amount of work on which, however, he had to make a profit. He generally employed his labour direct and avoided petty contractors as far as possible, as he looked upon them as a constant source of trouble and annoyance. The employment of large contractors would, he thought, avoid the present multiplicity of accounts, which could thereby be largely simplified. There would also be a saving in supervision charges, as large contractors could be relied upon to carry out their works without the detailed supervision necessary under the piece-work system. The firm employed a permanent labour force.

678. The theoretical training of the students turned out by the Poona College was, he considered, excellent, but they were found deficient in practical training. From his own experience he had found that students were unwilling to be employed in the drawing office, considering that it was not the proper place for them, but that they should be put immediately on to practical work as engineers in charge. They would not do manual labour, were not reliable, and had absolutely no sense of responsibility. He thought that improvement in the practical training of students could possibly be effected by sending them to private firms, if any could be found to take them, otherwise by taking them on to government works for a course of such training. He had had experience, in the course of business, of at least thirty graduates of the Poona College. No graduates were with his firm at the present time. The last man taken was on probation for a period of six months but stayed only for two. The scale of pay given to such men was Rs. 125 for the first, and Rs. 150 for the second year. The whole of the supervising staff employed by the firm were Europeans, with the exception of the out-door staff, who were men of the sub-overseer type; these men were not taken from the Poona College but were more or less practical *mistris* trained on the firm's own works. Private firms would, he thought, possibly be prepared to take students for practical training for one or two years. His own firm would certainly do so but would prefer not to pay them, as in that case they would cost more than they were really worth. They would, however, be prepared to pay them a living wage of Rs. 35 per mensem if they guaranteed to stay with the firm for three years, as they would become useful towards the end of such a period. This wage would be increased if they eventually proved successful.

679. (*Mr. Cobb.*) Past students of the Poona College would not, he thought, be willing to undergo practical training for Rs. 35 per month, nor was this really to be expected. He could not now obtain men of that stamp, but the ordinary type of draftsmen made good substitutes. Such men usually got their preliminary education in a high school, and entered a tracer's office at about the age of sixteen or seventeen. He had also had experience of Indian overseers in Salsette and had found them very good men.

680. (*Rai Bahadur Ganga Ram.*) The firm employed daily labour for both in-door and out-door work. The supervisor in charge made the necessary payments to the labourers but was not altogether to be trusted. The

witness, or one of the other European officers engaged by the firm, occasionally went round to see that the men were actually paid. He could not say what the youth who stayed with the firm for two months was doing at the present time. He might have learnt a few methods from the firm and have started business for himself. The pay of the *mistris* engaged by the firm varied between Rs. 45 and Rs. 75 a month; occasionally such a man was paid as much as Rs. 90 a month. The pay of the supervisors varied between Rs. 90 and Rs. 450.

681. If the Director General of Stores was located in India and ordered materials direct from local firms he thought that his firm would get better patronage and would be in a position to compete with firms in England. It was rather doubtful whether this would encourage local manufacture in India, but it would tend indirectly to keep more money in the country. If iron and steel were more extensively purchased in India it would lead to the establishment of further iron works in that country. His firm did not deal in machinery except as importers. Messrs. Marsland, Price and Co. did not manufacture either ordinary or clay bricks, but another firm, with which he was connected, did so, their rates varying from Rs. 20 to 26 per thousand according to distance. The factory of the firm he referred to was situated about 24 miles north of Bombay. Pressed bricks, manufactured by this company, could generally be supplied for about the same price as hand-moulded clay bricks, and he thought that government and the railways were generally aware of this advantage, but petty contractors were not, the latter being less progressive than government departments.

682. Indian cement, he considered, compared very favourably with imported cement. The former was just as uniform as British cement.

683. (*Mr. Mackenzie.*) The firm undertook lump sum contracts for buildings, but would have to look very carefully into the matter before they could consent to do so in the case of bridges. Lump sum contracts would not be suitable for either roads or tunnelling. They would be willing to undertake the construction of a masonry dam provided very careful borings were first made. As to earthen dams, he thought that the firm would have to act with great caution in undertaking such a work. Contracts out in the districts would be accepted only if they were large enough to make it worth the firm's while.

684. (*Sir Noel Kershaw.*) He believed that the Public Works Department usually employed one upper subordinate and one or two *mistris* for the supervision of a large work. If the system suggested by him were adopted there would be a saving both under this head and under that of accounts.

685. It would, he thought, be beneficial if the Public Works Department employed specialists more extensively than at present. In spite of the fact that his firm specialized in reinforced concrete, he would advocate the appointment of a government specialist in that branch, and did not consider that such an appointment would operate contrary to the interests of private enterprise. But even if the Public Works Department employed their own specialist, and that officer designed all concrete works, the witness would not recommend that such works should be carried out by the engineering staff of the Department as that would constitute a reversion to the system of carrying out work departmentally.

686. The student previously referred to whose pay was Rs. 125 per month, and who had left his firm after serving only two months, had had no practical experience before joining the firm. He thought that he had passed second on the list at Poona.

687. (*Rai Bahadur Ganga Ram.*) The witness stated that he would be quite satisfied with a profit of 10 per cent. on every work undertaken.

F. J. PRESTON, Esq., M.L.C.E., Chief Engineer, Great Indian Peninsula Railway.

Written Statement.

688. (VIII.) Practical training.—The idea is prevalent amongst technically trained Indians that when they

have successfully completed their college course they are fully equipped for any appointment. It will be seen from the 1912 Report of Lieut.-Col. Atkinson and

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T. S. Dawson, Esq., that they recognised that this was an idea to be discouraged. Nevertheless government has now forced the railways to accept a certain number of Indian gentlemen, and pay them salaries of—

Rs. 200 a month for the first year,

Rs. 225 a month for the second year,

Rs. 250 a month for the third year

to learn their work. In England such men would have

to pay premiums, instead of getting salaries which no student at home would dream of for several years after leaving college. A pupil is more likely to learn if some one is paid to teach him than if some one has to pay for the privilege of teaching him. In 1904 a committee appointed by the Secretary of State recommended the premium system to the Government of India but nothing seems to have come of it.

MR. F. J. PRESTON called and examined.

689. (*President.*) The witness stated that he was the Chief Engineer of the Great Indian Peninsula Railway Company and that that company had adopted the contract system for all except very small works. It was usual to employ large contracting firms; petty contractors were very seldom employed. Three or four English firms of contractors had been employed, but the bulk of the work was given to Indian firms. He was not able to say whether these large contractors employed their own engineering staff, but knew that they employed *mistris* as supervisors. The supervision over these contractors was performed by the railway staff of Assistant Engineers and railway supervisors.

690. He had had very little practical experience of the Public Works Department methods and was not able to compare the supervision during construction over contractors exercised by the railway company with that exercised by the Public Works Department, as the railway works lay only along the line, whereas the Public Works Department had works scattered all over the country. Repairs of the line were done by regular labour gangs and were not given out on contract at all. He did not think there was much difference between the rates paid to contractors by railways and those paid by the Public Works Department. The railway occasionally paid higher rates when they wanted a work done quickly. Time was a more important factor in railway work than in most other branches of engineering.

691. Railway district engineers had a great deal to do with accounts, and spent a lot of their time on them. The monthly accounts were compiled in the district engineer's office, and were not sent to a separate office for compilation. The pay-sheets and contractors' bills were sent each month from the district engineer's office to the chief audit office in Bombay, where they were checked. The railway company utilized travelling auditors for the inspection of their accounts. These auditors were mainly employed on supervising the accounts of stations, though sometimes they examined an engineer's office. He was of opinion that too much of the time of the railway company's district engineers was occupied with accounts work, to the detriment of their executive duties.

692. The railway company obtained most of its stores from England except small articles which were purchased locally. The stores purchased in England were not procured through the India Office, but through the railway company's home board, to whom indents were sent from India by the railway officers. He did not agree with the contention that it would be of great benefit to India as a whole if the local purchase of imported stores were encouraged to a greater extent than at present, and considered that the most economical system was the present one of obtaining stores from England through the home board.

693. The practice of employing Indian engineers under training on his railway on salaries of Rs. 200 rising to Rs. 250 was a new practice only recently adopted, and was the outcome of an order from the Railway Board suggesting the advisability of employing a certain number of Indian engineers of good family. The selection of these Indian engineers rested with him, as head of the railway engineering department. No distinction was made between men with English and those with Indian degrees, the only qualification insisted upon being that they should be men of good family.

694. The Indian engineering staff employed on the Great Indian Peninsula Railway consisted of draughtsmen and surveyors from the different technical colleges, who generally remained with the railway for two or three

years. If these men did well they were occasionally raised to the position of Assistant Engineers. They were not given out-door work in the first instance, but started in the engineering offices, from which they were drafted to out-door work. He was of opinion that the theoretical training of these graduates was very good and that some of them turned out to be good practical men as well. He approved of the suggestion that students should be given a course of practical training while in college.

695. His attention was called to a statement in his written evidence that a committee appointed by the Secretary of State in 1904 recommended the premium system for engineers to the Government of India. He admitted that the passage in this report to which he had referred related to Indians who had received their engineering education in England. There was so far as he could see no reason why facilities for the practical training of Indians who took their training in engineering in England should not be given on Indian railways and in the Public Works Department as such engineers were not at present able to get practical training in England, but he considered that they should pay premia for their training, which system, he thought, would ensure more attention being given to them. He was not inclined to advocate the grant of a living wage to engineers under practical training, and did not think that the low pecuniary circumstances of candidates formed a sufficient justification for such a course; in England if a man could not pay a premium he had to take up work as a draughtsman, or go into workshops.

696. (*Mr. Cobb.*) The biggest contract which the Great Indian Peninsula Railway Company had recently given out was for the construction of a tunnel at Mombra, which had cost about 20 lakhs. The railway's engineers, who always supervised big works, were supervising this work also. Tenders had been invited and four European firms and possibly one Indian firm had tendered for it. The contracting firms which had undertaken the work had their own engineer (a European) living at Thana. No difficulty was experienced by the fact that there were thus two engineers on the spot, one belonging to the railway company and the other to the contracting firm.

697. (*Rai Bahadur Ganga Ram.*) He was not able to say how many Indian engineers on the average were employed by his railway company, as the figure depended upon the number of resignations and retirements from time to time. The company employed nearly a hundred engineers altogether, out of which Indians did not, he thought, constitute as much as 10 per cent. All the railway's permanent engineers came out from England, and were appointed by the home board. For additional work temporary men were taken on in India. About sixty-four engineers were employed in the railway's regular maintenance corps. Selection and not competition was the method adopted in recruiting the railway's engineers in England and the Great Indian Peninsula Railway had never had an Indian engineer appointed by its home board; the board did not often get the chance of appointing one, as Indian engineers at home had not experience. He himself had appointed several Indians to the temporary Assistant Engineer staff of the railway, and one to the permanent staff, with the board's sanction.

698. The Great Indian Peninsula Railway had their own architect who had no responsibility for the actual construction of works but prepared designs and gave advice to district engineers.

699. The railway company had a general Stores Department from which the Engineering Department got its stores. He was not able to give any information as to the

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rules which regulated the purchase of stores by the Stores Department.

700. The rate of Rs. 14 for 1,000 bricks mentioned by him in the list of rates (not printed) attached to his memorandum referred, he thought, to bricks purchased at the kiln site.

701. (*Mr. Mackenzie.*) The railway company did not give out lump sum contracts. Schedule rates, in which particular quantities were not specified, were used, and contractors were paid at these rates. Tenders were not accepted at a specified percentage above or below the schedule rates; the contractors tendered at certain rates and the railway company did not specify any particular quantities or totals. This was done in order to enable a contract to be closed by the company irrespective of whether the whole work had been completed or not. The rates laid down in the list attached to his written

evidence were the railway's rates for places near Bombay. Up-country rates were in some cases cheaper.

702. (*Sir Noel Kershaw.*) The firm of contractors who had undertaken the construction of the tunnel to which he had previously referred were Europeans. He was not able to say whether they had any Indian engineers on their staff.

703. (*Mr. Kent.*) Sometimes the railway company gave their contractors facilities for the carriage of materials to the site of work; at other times forwarding orders were issued and the cost of carriage by railway deducted from the contractors' bills.

704. (*President.*) The contractors employed by the railway company were not obliged to take their materials from the railway stores and could make their own arrangements, but sometimes the railway insisted on them using cement from the stores.

THE HON'BLE MR. F. G. PRATT, L.C.S., Commissioner, Northern Division.

Written Statement.

705. (I) **Economy and suitability of methods of execution of public works and (V.) Decentralization.**—The opinion is very generally held that the methods now adopted for the execution of civil works are unsatisfactory. It is hard for a layman without special experience and inside knowledge of the Department to say exactly what is wrong or what reforms are required. Laymen can only judge by results and their general impression is that efficiency and economy are often conspicuous by their absence. Buildings are costly and ill-finished and bad work especially on roads is often observed. This may be due to the fact that the subordinate agency is badly trained, unpractical and inefficient or that superior control and supervision are defective, and both causes may be in operation. It may, perhaps, be not irrelevant

to suggest that some inquiry may be made as to the disciplinary powers now possessed by Executive Engineers. In a private firm a lazy or incompetent subordinate or servant will soon get the sack. Is it as easy as it ought to be for an Executive Engineer to weed out his bad bargains in the same way? Or would such a measure involve so much red tape and correspondence, and difficulty of getting sanction, that the Executive Engineer will usually take the easier course and get the offender quietly passed on to some other district?

706. (II) **Encouragement of other agency.**—The substitution, wherever possible, of private for departmental agency would be a highly desirable reform, but I think it very doubtful whether that substitution could be successful at present except in a very few large towns and cities.

THE HON'BLE MR. F. G. PRATT called and examined.

707. (*President.*) The witness stated that he was the Commissioner of the Northern Division of the Bombay Presidency, which appointment he had held for eighteen months. He had had experience as a Collector almost continuously up to 1909, but between 1909 and 1915 he had been Settlement Commissioner and, as such, had not been in touch with district work.

708. In the Northern Division there were practically no firms of substantial contractors who would be able to take over fairly large government works from the Public Works Department. There were also no architects in the strict sense of the word, but there were a number of buildings firms in Ahmedabad, a place with a population of about 250,000, which was the headquarters of the division and the second city in the Bombay Presidency. These firms were sufficiently competent to be able to construct fairly good buildings. He did not know of any firms of expert builders in the Northern Division not even in Ahmedabad, and did not think that the contractors there had made building-work a profession. When a building was required the contractor who undertook the work provided both labour and supervision. The building firms were really contractors for the supply of labour and materials.

709. He expressed his inability to substantiate, with any definite data in regard to expense, the remark in his written evidence that the buildings erected by the Public Works Department were generally supposed to be costly and ill-finished, and explained that when recording that statement he had in mind only general impressions. He had not compared the Public Works Department building rates with those at which private agency constructed buildings but had received reports from his Collectors comparing the results of work undertaken by these two agencies, the result of which comparison was very much to the disadvantage of the Public Works Department. He was not, in a position to say whether such lay criticism was really valuable and admitted that it was more in the nature of an impression than a proved fact.

710. He did not approve of the suggestion that all current annual repairs, apart from structural repairs of importance, now executed by the Public Works Department for other departments should be made over to the latter to carry out with the aid of a lump sum grant, and considered that to entrust the current repairs to a *mamlatdar's* building, for example, to the officer concerned would amount to a repetition of the inefficient *taluka-board* overseer. He was not inclined to change his opinion even when informed that the repairs in question would amount, in many cases, merely to colour-washing and tile turning.

711. The relations of the Public Works Department with the other departments in regard to work executed by the former for the latter were, he considered, on the whole satisfactory, though occasionally an administrative department was not pleased with the work done for it. On a few occasions he had himself found fault with work done for him. One such case was where he had had to intervene and insist upon a *mamlatdar's kutcheri* being re-constructed and not only tinkering repairs done to it, as the cost of these repairs would have been a pure waste of money considering that, even after they had been carried out, the *kutcheri* would have been positively dangerous to inhabit. This however he admitted to be an exceptional case.

712. Except for complaints relating to inefficient work on roads, (one of his Collectors had complained about the inefficient methods adopted for road construction, as distinct from maintenance, in Gujerat) he was not aware of any cases which could be made use of to support the Public Works Department officers' contention that officers of other departments interfered unduly with them in purely professional matters, nor had he had experience of a case where an administrative department, after requisitioning the Public Works Department to prepare a plan and estimate for a building, had frequently changed its ideas in regard to its detailed requirements, and so necessitated constant alterations in the project. He had never had occasion to notice the repeated return

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of plans on account of changes in the views of an administrative department as to its requirements except in the case of schools, in regard to which he recollected fairly frequent chopping and changing of plans to meet the requirements of the sanitary authorities.

713. The only works with which, as Commissioner, he was concerned were small works covered by his minor works grant, for which the procedure for obtaining administrative sanction before construction was very simple and clear. He was, therefore, unable to suggest any modification in the present system of obtaining administrative sanction to construction work to meet the Public Works Department contention that the present procedure was unnecessarily cumbersome and inconvenient.

714. As a Commissioner he was empowered to give administrative sanction to the construction of buildings the cost of which was covered by his minor works grant. Though this grant included buildings costing up to a limit of Rs. 5,000 it was very rarely the case that the cost of buildings sanctioned by him reached as much as Rs. 3,000 or even Rs. 4,000.

715. Although the prices of buildings had risen and a Commissioner's limit of sanction for minor works had not been increased for many years, he thought the present system quite suitable and considered that it was unnecessary to raise the limit of sanction from Rs. 5,000 to Rs. 10,000 because in his case, at any rate, his experience was that the average cost of the minor works sanctioned by him was very much below Rs. 5,000 and was often only about Rs. 600 being the cost of constructing an extra room to a building or some similar work.

716. There were thirty-three municipal urban councils in the Northern Division, and, generally speaking all these local bodies made their own arrangements for their works except big towns like Ahmedabad, Surat and others with a population of about 150,000, which obtained the assistance of the Public Works Department. These large cities utilized the Public Works Department staff for the preparation of plans and estimates for large sanitary works, water-works, and drainage, and also for the actual construction of the same. Recently, however, a European engineer had been engaged at Ahmedabad on a substantial salary, and witness thought this officer would himself do some of the work which used to be handed over to the Public Works Department. As a general rule, municipalities in the Northern Division constructed their own buildings, though the staff they had at their disposal was usually very inefficient and underpaid.

717. The rule empowering a district board to carry out work of its own up to a limiting cost of Rs. 2,500 and requiring such a board to submit the plans and estimates of any work the cost of which exceeded Rs. 500 to the Executive Engineer for prior sanction was in force in the Northern Division. He was strongly in favour of the proposal that district boards should be encouraged to provide themselves with a satisfactory engineering staff of their own for their own works but considered that the feasibility of this scheme depended upon the amount of expenditure which each board could incur, i.e., upon whether this expenditure was large enough to justify the entertainment of an engineering staff. He thought the district boards would welcome a change in this direction and would like to have their own engineers if sufficient work were available, but added that the boards would view the change from the point of view of the expense it would involve. As a business proposition, however, he thought they would like it.

718. He was also prepared to recommend that such district boards as had a competent engineering staff should be allowed to construct and maintain, within a certain monetary limit, minor government building works, such as police stations in outlying places, provided the boards themselves desired to do so. He explained that by this he meant that he was not quite sure whether a municipal engineer who had his hands full with the work of his own board would or would not be able to take on additional work. Such an officer might be able to attend to a minor government building while repairing neighbouring roads belonging to his district board, but the

deciding factor was, he considered, the competence of the engineer. This competence did not altogether depend on the amount the district board was prepared to pay for its staff, as a certain amount of supervision and control was also necessary. Under the Bombay Municipality Act, even in the biggest municipalities, government had power to order the removal of an engineer if this was necessary. Although under this Act the qualifications for an engineer were not laid down, government could veto the appointment of a particular municipal engineer, or, if such an officer had been appointed, they could order his removal. This applied to all except small municipalities. It would therefore be a good thing if the government control over the appointment and removal of the district engineering staff were maintained.

719. The principle followed in the classification of roads in the Bombay Presidency into provincial roads and district boards roads was that main trunk roads, which formed through communications between different districts were classed as provincial roads and roads which supplied the wants of one district only were classed as district board roads. No general rule however could be laid down to distinguish between these two classes of roads, as in some cases important district board roads on which there was a great deal of traffic had been provincialized. District boards were always glad to have the construction and maintenance of their roads taken off their hands by the Public Works Department because such boards were usually terribly hard up for money and could not afford to attend to the repairs necessary for such roads.

720. The reason why certain roads, for which the district board provided funds, were handed over to the Public Works Department for maintenance was, he thought, the result of the rules under the District Board Act, which insisted that original construction work costing above a certain amount and also its subsequent maintenance should be done by the Public Works Department. If this was not the reason, he thought that it was probably due to the fact that district boards could not usually trust their inefficient staff with the money and had no really competent staff for the maintenance of the roads.

721. Provided a district board had a competent engineer of its own he was of opinion that, if it were allowed to construct and maintain its buildings and roads, there would not be reasons for fixing a money limit on the cost of buildings or expenditure on roads above which the construction should be transferred to the Public Works Department.

722. The scheme under which the local bodies and district boards that could not afford to employ engineering staff of their own might combine with one another and employ an engineer between them was worth trying, and he was not aware of any reason why it should not work well. The possibility of friction owing to the demands of separate individual bodies upon a single staff should be considered, but he thought this was not an insuperable difficulty if it was assumed that these various bodies desired this arrangement and had asked for it. He approved of the scheme of having a common divisional cadre for the engineering staffs of district boards so as to hold out prospects to engineers in small districts of being transferred to better appointments in larger ones. The district boards would, he thought, have no objection to such a scheme and, as they had at present no engineers, there would be no question of lessening their control over the appointment and management of their staffs, though the desire to be entirely self-contained in the matter of staff might spring up and constitute a difficulty.

723. He had had a good deal of famine experience. Famine works were at present practically entirely managed by the Public Works Department. Even if the scheme of having a district board engineering staff came into force, he did not think that it would make much difference as, though he might be considered to be rash, in his opinion famine administration in Gujerat was a thing of the past. Although a famine had occurred five years ago in the Panch Mahals, the last serious famine in the Northern Division had occurred in 1899, and he did not think that that division would ever have many people on famine

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works again. The reason for this belief was his experience last year when there was nearly complete crop failure over large tracts and the situation in some of them was practically the same as it was in 1899 when people died like flies. It was not easy to say where the difference lay. The division was not very much more secure than formerly so far as irrigation was concerned but communications were better and people migrated more easily. The inhabitants of Palanpur, for instance, who in 1899 died without a struggle, last year moved wholesale into Sind and got work there. There was no distress. Famines of the future in the Northern Division would be more easily managed because of increased credit and increased economic strength generally. He was not able to speak for the Deccan as he was not familiar with that portion of the presidency, but in regard to the Northern Division he thought that the Famine Code could be taken to be obsolete.

724. Even if it were assumed that there were tracts where a famine might occur, and although the big famine of 1899 had involved the employment of very large establishments, it would not be worth the while of government to take power to requisition all the district board engineering establishments as the whole of these establishments would be but a mere drop in the ocean of what would be required for a serious famine. These establishments could, however, be made the nucleus for expansion as was the case with the present Public Works Department agency. He did not think the introduction of this district board engineering establishment would place the country in a very much worse position than it was at present should a famine occur.

725. (*Mr. Cobb.*) The municipality at Ahmedabad had constructed buildings of its own and was now engaged in building a large market. He was not sure whether this work had been given out on contract or was being done by the municipality itself by means of ordinary labour contract arrangements. This municipality was responsible for the schools in the city and ought to rebuild them but were not doing so at present.

726. (*Rai Bahadur Ganga Ram.*) His observation, based on his general impressions, that the cost of works constructed by the Public Works Department was excessive when compared with those constructed by private agency, referred to ordinary private builders' work and not to work undertaken by contractors.

727. There was no rule in the Bombay Presidency similar to that in force in the Punjab under which the appointments of local board engineers were subject to the approval of the Public Works Department. The rules under which the appointment of municipal engineers was subject to the approval of the Public Works Department applied only to city municipalities.

728. (*Sir Noel Kershaw.*) The attention of the witness was drawn to his previous reference to a report received from one of his Collectors criticising the Public Works Department construction of a new road. He admitted that he was not able to vouch for all the statements contained in the report but observed that the criticism was directed against the professional methods of the Public Works Department.

729. (*Mr. Kent.*) A district board would naturally welcome the taking over of a road by government and the provision by the latter of all expenditure incurred in maintaining it. He was not able to state definitely that district boards would welcome as a business proposition the suggestion that, if they had a sufficient and competent staff of their own, they should take over, in addition to their own works, certain works now carried

out by the Public Works Department. This depended largely upon how much work of their own they had, and upon the competence of the engineers employed by them. If, however, these requirements were fulfilled, he saw no reason why a scheme of local fund engineers in Bombay similar to that in force in Madras should not work economically.

730. He did not know what percentage the cost of the present local fund establishment bore to the total amount of work done by them. Even when informed that, for the whole presidency, it amounted to 9½ per cent. he was still of opinion that a district board engineer, though he might not be able to carry out works more cheaply, would probably be able to do them more efficiently, since it was possible that at present the Public Works Department engineer had not enough time to attend to the district board works as well as he ought to.

731. The present district board staff consisted generally of an overseer, and possibly a sub-overseer for each *tahsil* and sometimes a district board overseer for each *taluka*. He admitted that under the district board engineering scheme there would have to be some increase in the subordinate staff of the district in order to cope with the extra work, and as in addition to this it was proposed to employ a fairly well-paid engineer to control public works in each district it did not seem possible that the percentage cost of this establishment would be as low as 10 per cent. which was the percentage at present charged by government to local bodies for works carried out for them by the Public Works Department.

732. With reference to his previous admission that he thought it possible for local bodies to combine and employ an engineer between them, he remarked that he considered that this scheme would work even though the average area of some districts in the Deccan at present was 5,000 square miles, seeing that the Khaira and Panch Mahals districts were now under one Public Works Department engineer. He admitted, however, that together the area of these two districts did not exceed 6,000 square miles, but added that improved communications made a difference now-a-days and that on the analogy that a Commissioner had to control several districts (in his case six districts), and so had time to attend to only important matters, a district board engineer should be able to control more than one district by leaving smaller matters to his subordinates. The form of control to be exercised by government over the district board engineers should be analogous to the control government had at present over engineers in municipalities. Their appointment should be approved by government, and government should have the right to remove a man if he were found incompetent. This might, however, involve a certain amount of inspection by a government expert in order to ensure that work was being properly carried out, as was now done in the case of municipalities. He was not, however, prepared to say that government control over district board engineers by means of an inspecting staff was essential, but thought that it might turn out to be necessary. He was unable to say how far the scheme of having district board engineers would effect the duties of the present Chief Engineers and Superintending Engineers of the Public Works Department, but thought that even if the scheme came into force there would still be enough work for these officers to do. At present the Executive Engineer in each district was usually a nominated member of the district board but did not as a rule, he thought, sit on municipal committees.

O. C. ORMSBY, Esq., M.I.C.E., Chief Engineer, Messrs. Pauling & Co., Shirawta.

Written Statement.

733. (II.) Encouragement of other agency.—Though the annual expenditure on roads and buildings in the Bombay Presidency must be large, the area over which the expenditure is incurred is so great that the organization of any contractor carrying out all the presidency work would have to be on more or less the same scale to that

of the Public Works Department. But a considerable portion of the government supervision must remain as presumably the contractor would not be allowed to certify his own bills for work done. No contractor would care to carry out such work departmentally, and the final result would be that all of it would be let out in small sections to petty contractors and the rate paid to the

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contractor must allow for (a) cost of financing petty contractors, (b) cost of organization, (c) profit. Against this might be set a small saving to the contractor due to his employing the cheaper form of labour which cannot or will not work without frequent cash advances. But from what little I have seen of the Public Works method of carrying out small works, I believe that the petty-contract system is adopted when possible and therefore to introduce a contractor would probably involve additional cost to the government without any corresponding advantage. Under the present system government can regulate its expenditure to suit the state of the public finances. Policy may force it to economize in one department in order to provide funds for other purposes.

(2). Again, even after a certain expenditure has been sanctioned for an individual year, famine, floods or other causes may force the greater part of the expenditure to be incurred in quite a different part of a province to that for which it was projected. These alterations in policy as regards expenditure, though comparatively simple to a government whose total expenditure on public works in India will not vary greatly on an average, would make things most difficult to a contractor for a certain district, as his staff might be disorganised and his financial arrangements upset. He would be unlikely to agree to provisions for such contingencies being made in his contract and if such were not made he would certainly ask for some compensation. But the Delhi New City is a very obvious example of road and building work where it would appear that a contractor might be usefully

employed and there are other similar cases to be found in the large irrigation works carried out by the Department.

734. (VII.) Education.—The quality of the assistants with whom I have had to deal, and who have been educated solely in India, varied greatly and the root of the trouble usually seemed to be that though they had acquired a considerable amount of "book-learning" they had no idea as to how the information gained thereby could be turned to practical use. The following is an example of what is meant: An experienced draughtsman was told that it was only wasting his time to take into consideration more than two places of decimals while working on the calculation of earthwork areas. A few days later he was given some other calculations to make which dealt with very small angles and for which the use of sines and cosines was required. On handing in his results it was obvious that they were hopelessly wrong and his explanation was that carrying out previous orders he had neglected all but the first two decimals. In the first case the omission of the decimals involved a possible difference in payment of one half-anna, in the second it would have meant the complete disorganization of a railway station. This difficulty with Indian-trained students might be considerably reduced by rendering it obligatory for the second years' training to be spent on works where the students would see the principles, which they had been taught in their first year's course, applied in actual construction.

MR. O. C. ORMSBY called and examined.

735. (President.) The witness stated that he was the representative of the firm of Messrs. Pauling and Co. whose headquarters were located in England.

736. The firm undertook contract work in India, their head office being in England with a local office in Bombay. They had carried out three large works on contract, two for the Tata Hydro-Electric Company and one for the Great Indian Peninsula Railway, the latter being a special piece of tunnelling in connection with the diversion of the railway line at Mombra. The supervising staff employed by the Tata Hydro-Electric Company consisted of a consulting engineer who was in charge of the whole work, a consulting hydro-electric engineer, a resident engineer, two or three English assistants, and a considerable staff of Indian assistants. As the work was spread over ten miles the exercise of a certain amount of supervision over the different gangs of men employed was also necessary, and this was entrusted to a subordinate staff. The Great Indian Peninsula Railway exercised very little supervision in the case of the tunnel; only a resident engineer was employed, and no subordinate staff was maintained. The senior staff employed by his firm were more or less permanent men; juniors were usually engaged for each particular work.

737. His firm carried out work departmentally only if special skill were required, or if the work was such that it was impossible to fix a rate; the filling in of an excavation, for example, after timbering was finished, would always be done by piece-work. Piece-work contractors were usually employed, as his firm had recognized that departmental work was not generally profitable and that better value was obtained by the former method. There were, however, exceptions. He could state, from experience, that a considerable amount of trouble was given by petty contractors engaged on contract work; their progress was not quick enough, they very often did not pay their labour, and they were continually asking for increased rates with the result that his firm had discontinued the practice for that class of work when rapid progress was essential. For masonry work also he was inclined to favour the employment of departmental labour, provided it was on a sufficiently large scale to allow of very thorough supervision.

738. They did not usually give out large sub-contracts, as they had tried two which had not been a success. So far as his experience of Indian conditions went he consid-

ered that the best method of construction was through piece-work petty contractors. The majority of the contracting firms had not sufficient money at their command, and although after taking up a contract they would work very well for a few weeks, their labour decreased in a very short time owing to the fact that their men were not paid, the result being that it was necessary to give advances, failing which progress on the work gradually slackened off.

739. His firm had tried many graduates of the different Indian engineering colleges, and he considered that the theoretical part of their training was satisfactory. Two of these men came from the Poona College of Engineering and one from Roorkee, and proved satisfactory. The practical side of their training was deficient, and he considered that, if more attention were given in this direction, they would learn better how to apply their book-learning. He had taken one or two men direct from college without any previous practical experience but had found them to be of little use. He thought that his and similar firms would be ready to undertake the practical training of some of these students on works in progress, so long as they did not make trouble and applied themselves to the work on which they were employed. It would be an easy matter to put such men on different classes of work for a few months on each. The best method of training students for the engineering profession was, in his opinion, the adoption of the 'sandwich' method which was the system recommended by the Institution of Civil Engineers. He explained that under this system the students, after they had reached a certain pitch in their theoretical training, would be sent on to works, returning thence to their colleges to finish their theoretical training.

740. On the whole he doubted whether there was much scope in India for the employment of large contractors in connection with the Buildings and Roads Branch of the Public Works Department; such firms could not afford to work at Public Works Department rates, the work being so scattered and disjointed.

741. (Sir Noel Kershaw.) The different engineering colleges would, he thought, experience no difficulty in giving practical application to the 'sandwich' course of training which he had advocated except in the first year of its adoption, after which things would automatically settle themselves. The present course of theoretical

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training extended over a period of three years, but by the adoption of the 'sandwich' system the second year's training would become the third.

742. (*Rai Bahadur Ganga Ram.*) His firm had been undertaking work in India for the past six years. Had the Railway Department not employed a large firm like Messrs. Pauling and Co. they would undoubtedly have had to engage extra establishment and thereby incur increased expenditure. It was rather difficult to say exactly how much the saving had been in this connection. The contract for the railway work undertaken by his firm contained a schedule of rates, but he could not say to what extent the rates tendered by his firm differed from the ordinary rates paid by the railway. The principal item

was for tunnelling. The rate for masonry was based on the railway's schedule of rates, nothing extra being allowed on this item to his firm.

743. One particular Indian assistant whom he had engaged proved to be a very good man indeed. After leaving the firm this man returned to the Public Works Department as an Assistant Engineer and was now working in Delhi. He did not know whether any such men, after leaving the firm, set up as contractors themselves.

744. (*Mr. Cobb.*) His firm did not employ students at the present time but only passed or failed men. Some of these had proved very satisfactory. He would prefer to get them at an age of not more than twenty-two.

At Bombay, Tuesday, 16th January 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

C. S. COBB, Esq., M.V.O.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

R. J. KENT, Esq., Chief Engineer and Secretary to Government, Bombay.

D. G. HARRIS, Esq. (*Secretary*).

The HON'BLE MR. B. S. KAMAT, Contractor, Poona.

Written Statement.

745. (I.) *Economy and suitability of methods of execution of public works.*—The methods at present adopted for the execution of civil works cannot be regarded as economical, considering the fact that the percentage of charges for establishment to outlay on works and repairs varies between nearly 20 to 30 per cent. Neither are the methods suitable at the present day for the purpose they were originally devised. Since the early days when they were devised, various changes have occurred in the country; there has been a considerable development in the local boards; plans for small buildings such as *kulcheries*, dispensaries, school-houses, etc., have been mostly standardized; for purposes of supervision on the part of the engineering staff, communications have improved owing to roads or railways or motor-car facilities; and if private agency of trained men from the engineering college is to be introduced to undertake the execution of work there is a sufficient output every year available. The present system therefore can be rendered less expensive by (i) the Executive Engineers being relieved of local board works up to certain limits, as is already contemplated by government, only works requiring high engineering skill or works of special magnitude being left to the Executive Engineers; (ii) by repairs to civil buildings of a small nature being left to the civil officers concerned, subject to certain limitations and final approval by the Public Works Department.

746. (II.) *Encouragement of other agency.*—Under the existing system private enterprise, such as it is, is availed of by the Public Works Department where possible, though it cannot be said that private enterprise of the right type is sufficiently encouraged. In Bombay as well as in the *mojussil* buildings are let out by contract, or material purchased by calling tenders. But with certain notable exceptions the bulk of men who undertake works are not professionally qualified, nor do they maintain a qualified staff of assistants in their employ; in many cases they are illiterate or semi-educated. This entails naturally a very close supervision on the part of the Public Works Department to ensure soundness and good quality of work, and requires guidance at every stage to keep the contractor's *mistri* to the plans and specifications.

(2). What is necessary, therefore, is to introduce trained men or private engineers, or civil engineers' firms to undertake works, or to insist on contracting firms of standing to maintain qualified staff. Works should be entrusted to only recognised men or firms. In Bombay there are such firms who undertake the designing and supervision of large buildings at a percentage over the costs, the actual construction being in the hands of contracting firms working under their supervision. In the *mojussil* it is possible to encourage on a wider scale such enterprise. Probably in the beginning such a qualified agency may demand higher rates for work than now in vogue owing to the necessity of having to maintain a trained staff, but in a few years the play of competition would come in and the rates demanded would not be unnecessarily high. The supervision on the part of the Public Works Department would not be so expensive over such a private agency, the unqualified contractor would go to the wall, and firms or men with a reputation to lose would take his place. Each contracting firm will no doubt have to be guaranteed a sufficient amount of work per annum in the sphere allotted to it, provided it shows good work.

(3). If such a system of private enterprise is encouraged both for construction and upkeep of buildings, there would be considerable relief to the Public Works Department from the present detailed supervision, with the result that eventually the divisional charge in suitable places can be enlarged, and the Executive Engineer would be able to devote himself more to projects than to routine work.

747. (III.) *Changes in organization.*—If the modifications in the present system outlined above are accepted, namely, the transference of small works to the local boards, and the wider employment of qualified private agency, instead of the present expensive departmental one, it would be practicable to enlarge the executive unit of the Department in certain places. The Superintending Engineer may be retained for professional advice and to co-ordinate the work of the districts in his circle. Whenever necessary for any special works only temporary engineers may be entertained.

748. (VII.) *Education.*—So far as I can judge from the graduates turned out from the government engineering college, the system of education is organized on a suffi-

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ciently broad basis to meet the needs of private agency ; it attracts suitable candidates ; the standard of instruction is sufficiently advanced to provide fully efficient and qualified engineers for employment by private engineering or contracting firms. The only improvement necessary, to my mind, is the need for greater opportunity for practical touch with works for the students, and to specialize in any particular branch of study as railway construction, or irrigation, or masonry and designs.

749. (VIII.) Practical training.—There appears to be greater need of practical training for students on works

in progress. Such a training is essential, not only to any selected candidate or candidates, but for all students. Final year students of the engineering college should be given more opportunities than at present to visit large works in progress, for instance in the docks or railways, etc., to watch the details of work, management of labour and so on ; and wherever possible they should be apprenticed to recognized engineers or private engineering firms to gain a practical knowledge of labour, actual construction, the keeping of accounts, etc.

The HON'BLE MR. B. S. KAMAT called and examined.

750. (President.) The witness stated that he was a building contractor of Poona and that he worked chiefly on the Great Indian Peninsula Railway. He was also contractor for the limestone quarries in the Nizam's territory, and supplied stone to the whole presidency and to the railways as well. He was not an engineer by profession, but had acquired practical experience.

751. He did not employ any permanent professional staff, but, whenever a particular work necessitated it, he engaged such a staff temporarily. He had executed building work connected with railways, but not for the Public Works Department. His firm had specialized in railway work, and had been engaged for about thirty years on railway work of different kinds, e.g., construction of engine sheds, platforms, bridges, culverts, etc. They seldom tendered for building contracts in the Public Works Department in Poona as they preferred to restrict themselves to railways, but occasionally they had done a certain amount of Public Works Department work also. There were a number of contracting firms in Poona, but few of them were capable of undertaking large works. The heads of these firms were not trained men nor did they usually employ a trained staff. There were two or three firms working for the railways which employed a professional staff. The contracts which the firm undertook were carried out by their own labour, but they employed piece-work contractors for such small items of work as collection of bricks, lime, etc. The firm employed their own masons and carpenters paying them at daily rates.

752. He considered that the employment of large contractors was preferable to that of petty contractors since the latter were mostly illiterate and depended solely on their *mistris*. Large contractors could understand plans and designs, and hence could supervise work from a professional point of view. The advantages that would accrue from their employment were firstly, the creation of a greater sense of responsibility on the part of contractors themselves, and, secondly, the reduction to a great extent of the detailed supervision which the Public Works Department had now to exercise. He did not agree with the view that large contractors required the same amount of supervision as the petty contractors and, as far as his experience went, he thought that, if an engineer knew that a respectable firm of contractors were carrying on a work, he supervised their works less than those of petty contractors whose operations had to be watched very carefully. Large contractors could also be trusted in regard to the quality of their work.

753. To ensure the supply of good contractors they should be guaranteed a certain amount of Public Works Department work every year. The Public Works Department was in the same position as the railways which, though they did not give a guarantee, always gave a particular kind of work in a particular area to a specified contractor and did not, as was often done in the Public Works Department, turn him out when the work on which he was engaged was finished and give the new works to another man. Under the Public Works system a contractor had no fixed interest in any particular area. The witness believed that a somewhat similar plan to that which he recommended had been followed in the Excise Department whereby certain liquor contractors were guaranteed certain shops provided they did no illegitimate business. He would favour a system

of registration of contracting firms, and suggested that a condition of registration might be that these firms should employ a certain number of engineers, i.e., L.C.Es. and B.Es. on their staff. He did not think this would prevent the formation of new firms, or close the market to expansion. At present the whole field was open to petty contractors who were willing to cut rates at the expense of the quality of their work. He advocated also the formation of trades unions of contractors, and desired that government should recognize them. This would give the contractors some status which would result in giving them a sense of responsibility. Government contractors should be distinguished from those employed by local boards as he had advocated that certain works should be handed over to local boards entirely.

754. The witness had had no direct connection with district boards, but had been connected with a suburban municipality and with the city municipality of Poona. The Poona Municipality carried out its own public works, and maintained a trained municipal engineer with a separate staff for professional supervision. For the supply of materials, etc., it employed petty contractors, and for building and other work it confined itself to two or three good men who, however, had no monopoly in the real sense of the term. The town roads in Poona were maintained by the municipal engineer, and the metal for these roads was purchased by the municipality. He had had no direct experience of district boards. He believed that the more advanced district boards would welcome a system under which they would employ their own staff rather than entrust their work to the Public Works Department ; for example, the Poona district local board would be very glad to manage their own public works with the aid of a district engineer, in which case they would construct their own roads and buildings. He considered that government should make a small beginning in the direction of entrusting the construction and maintenance of minor government works to such district boards as Poona and Ahmedabad, and suggested making over all government roads, except the main provincial routes, to the district boards. The provincial roads should remain under the Public Works Department, as in their case it was necessary that some continuity of policy should be assured, and a certain standard of efficiency maintained. The district boards were not sufficiently advanced at the present stage to enable them to maintain such roads ; in any case, the capabilities of the boards varied considerably, and the feasibility of the scheme must depend largely on the amount of work which any particular district board engineering staff could undertake. The execution by the district boards of all local works, if supplemented by the addition of small government buildings, would justify them in appointing an engineering establishment of their own. The expenditure on public works by the Poona district board was about one lakh of rupees a year and this, coupled with small government buildings, would give sufficient work for the engineering staff of that board. An experienced sub-engineer would be able to manage a district of that size, provided that all plans handed to him for execution were first approved by the Public Works Department. Such an engineer would be able to take over and manage such buildings

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as *kutcheris*, *dharamsalas*, schools, etc., with the supervision of the works committee of the board. He would have no objection to the inspection of such works by superior officers of the Public Works Department, and thought that that Department should have the right to come and supervise any particular work, and to point out defects when discovered.

755. As regards the powers of appointment and dismissal of officers appointed by the district boards he thought that, on the analogy of the municipalities, the district boards should not be interfered with, but agreed that a statutory provision in regard to the district board staff, similar to that which existed for the municipal staff, should be made. In case fault were found with the work executed by a district board the man responsible should be punished, and he thought that government should have powers of punishment over the local board staff in case of proof of dereliction of duty. If it were found that government money was being wasted, he did not consider that the district board should be held responsible. A similar waste sometimes occurred in the Public Works Department.

756. He considered that a scheme under which the petty repairs of certain government buildings would be made over to the departments concerned would result in the saving of a good deal of time. A *mamalatdar* could easily be entrusted, for instance, with such work for his buildings, and an officer could make a round and see that the right number of men were being employed. He admitted that a *mamalatdar* would have no previous experience of work of this nature but explained that, as these repairs were for the most part very simple, he would in course of time be able to manage. He considered that repairs could be done by the district board staff in headquarter towns and even in *talukas*. Repairs to primary schools throughout the districts were carried out by the local boards, and they might also be allowed to undertake the repairs to Collector's buildings, *kutcheris*, etc.

757. A number of overseers and graduates of the Poona College worked under his firm, which employed them temporarily. They generally got men who had retired from the Public Works Department and as such were very good, but occasionally they tried men direct from the college and these were not quite so satisfactory. They had to be taken on as apprentices and had to be taught all the details of the business such as the keeping of the muster rolls, the supervision of labour, purchase of material, measurements, etc. He endorsed the view that the theoretical training at Poona was satisfactory, but considered that there was a lack of practical training. As a remedy, he suggested that students should be placed in charge of certain works, for instance on big works in Bombay, on railways or on irrigation works, before they got their degrees, and suggested postponing the conferring of a degree till at least one year's practical experience on works had been gained. As a practical man he considered that, unless an engineer took practical training, he could not be said to be qualified. He was not in favour of putting this training in the middle of the theoretical course, but preferred that it should be at the end. Such training should be given by the Public Works Department by posting such men as Sub or Assistant Engineers wherever big works were going on. Some of the firms in Bombay might also be willing to take candidates for training. He was not in favour of giving these men a living wage during the period of apprenticeship, and he thought that even without such a wage students would be willing to undergo such training if they were given a chance of experience on big works. If, however, they were put onto ordinary works, there might be complaints and the students might not stay on. He admitted the difficulty that the number of large works going on at any particular time was limited. He did not think that the present age (twenty-five or twenty-six) at which these men entered professional life was too advanced, nor did he think that the year's practical training suggested by him would make much difference. It would be of great advantage to the students. He

was not in favour of lowering the educational standard for admission into the engineering colleges and introducing a certain amount of general education into the courses of the latter. He would prefer one year's practical training added at the end of the college course to the proposal made by the University to extend the college course to four years instead of the present three.

758. (*Sir Noel Kershaw*.) A great saving in the supervising establishment would, he thought, be effected if large contracting firms were employed, as at present there was a regular chain of officers who were responsible for supervision. If the firm of contractors employed maintained a trained staff of their own capable of understanding plans and quantities and following a plan without committing a mistake, and if the contractors' status were recognized, it would only be necessary for an Assistant Engineer to go round occasionally at certain stages of the construction and to certify that the work was of good quality. He did not know how the system worked outside India, nor did he know whether it was ever tried in England, nor could he say whether the Indian contractor required better supervision than the European contractor.

759. He would not extend the system proposed to the construction of bridges, etc., requiring high technical skill, as in those cases detailed supervision on the part of an engineer was necessary. But in the case of small buildings there was at present too much supervision, and much of the work executed by the Public Works Department was of so simple a nature that large contractors could carry it out without any supervision at all. A large contractor would be willing to undertake such work if he were guaranteed a minimum amount of work in a particular area. He thought that if a large amount of work were going on in a particular district, a contractor would be satisfied if he were given only a portion of it. He instanced the case of the Great Indian Peninsula Railway which gave, for instance, a length of 320 miles between Poona and Raichur including bridges, culverts, etc., to two or three big firms of contractors. The railway works whether large or small were distributed every year among these firms. Similarly, if the Public Works Department divided the work in a district between two or three contractors, they would be willing to undertake it. He admitted there was a difference between Railway and Public Works Department work, but, in these days of railway communications he did not think it would be impossible to divide the work of a district between two or three contractors.

760. (*Mr. Mackenzie*.) From the budget statement he calculated that the percentage of supervision charges in the Public Works Department came to between 20 and 30 per cent., but in the case of his own works he would consider 15 per cent. a fair charge. The only man he would employ for constant supervision on a work costing say Rs. 50,000 would be a trained *mistri*.

761. He preferred the system of giving practical training at the end of the college course, the last year of the course being spent not only in visiting works but in actually doing practical work, managing labour, watching carpenters, masons, etc., under the orders of an Executive Engineer. For instance if a bridge was being constructed half a dozen students should be detailed for the work. These students should live at their own expense and should be expected to manage the whole thing under the orders of the engineer in charge. In this way the students would obtain practical training. He considered that it was only fair that students should bear the expense and that government should not be burdened with it. He admitted that this would be some restriction on the class of men who would join the engineering profession, but he would prefer to have fewer men with practical training than a larger number without it.

762. (*Rai Bahadur Ganga Ram*.) He inherited his business from his father and had been engaged on it for seventeen or eighteen years. He had had no training when he joined, as he had not intended to take up contracting but had intended to follow another profession.

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763. It was not compulsory for railway engineers to call for tenders, and such an engineer, if he were satisfied with a particular contractor, could at his discretion give him any work he cared to.

764. The rates of the railways and the Public Works Department differed in different localities, but generally speaking the railway rates were a little higher.

765. He reckoned his establishment charges at 10 per cent. on the work executed, and considered that 15 per cent. would not be excessive, but the Public Works Department rate had gone up to 25 per cent. in certain years.

766. In Bombay itself there were probably men who had passed the Poona College course and then become contractors, but he did not think that there were any outside Bombay. The obstacle to their becoming contractors was usually want of capital, and there was possibly also a feeling that the status of a contractor was not good enough for them. Certain persons considered it beneath their dignity to take up contracting work, as the majority of contractors were illiterate, and hence the educated L.C.E. hesitated to join their ranks.

767. (Mr. Cobb.) He considered that if the work of a district were distributed between four or five reliable contractors and a schedule of rates were prepared, these contractors would not bid against each other. He did not think that they would form combinations or rings. They would conform to the schedule. The system would result in great saving on account of the reduction possible in the supervising staff, as a single Assistant Engineer would be able to look after the various works.

768. (Mr. Kent.) Under the scheme he outlined for the

Poona district, the Superintending Engineer would be retained and an Assistant Engineer would look after all the district work, unless, of course, there was a big work of a highly technical nature on hand. This Assistant Engineer would have practically the same powers as the present Executive Engineer, who could then be dispensed with. His duties would be to supervise works in progress, and, in regard to designs, he would submit those for works costing more than a specified sum to the Superintending Engineer. The Superintending Engineer would have the right to inspect the works whenever he chose, or when he was consulted.

769. The witness did not advocate making over the provincial roads to local boards, but the boards could manage their own roads. The government engineer would look after the government buildings and the provincial roads, leaving the rest of the work to be looked after by the local board. The transfer to the boards of the small buildings and local board roads would result in a great simplification of his duties, and at the same time would be more economical than the present arrangement. At present, local boards had to pay 10 per cent. of the cost of construction and maintenance of their roads to the Public Works Department. They maintained only a very poor staff, but he had no idea of the cost. On being informed that it came to about 9½ per cent., the witness admitted that there would be no saving in that case.

770. All the staff employed by his firm were Indians, and those who were temporarily employed from the Poona College were quite adequate for the purposes for which they were required.

The HON'BLE MR. LALUBHAI SAMALDAS MEHTA, C.I.E., AGENT, MESSRS. MARSLAND, PRICE AND CO., LTD., BOMBAY.

Written Statement.

771. (I.) Economy and suitability of methods of execution of public works.—The methods for the execution of civil works by the Public Works Department are not quite suited to the present conditions. They are again not as economical as they can be if they are modified to make them suitable to the altered conditions. The percentage of the establishment charges according to the budget estimates of 1916-17 comes to a little more than 30 per cent., but the correct percentage, after making allowance for the works done by the Department for local boards, is about 25 per cent. This percentage is much higher than that for 1914-15, owing mainly to the total amount of the expenditure on works being Rs. 86 lakhs as against Rs. 51 lakhs provided in the budget for 1916-17. Private agencies can carry out the works at a lower percentage of expenditure than even that of 1914-15.

772. (II.) Encouragement of other agency.—There is a great deal of force in the suggestions contained in the Government of India's resolution appointing this Committee, about the possibility of works of a simple and unimportant character being carried out at reduced cost by contract, or by local agencies under government supervision. As the field of selection of men by local bodies making the appointments of engineers for local works is likely to be a restricted one, and as local bodies that are new to this kind of work will not in the beginning be able to exercise as strict a supervision and control as men of the Public Works Department, it is possible that in the earlier stages of these reformed methods some of the works will not satisfy the requirements of the Department. But as things settle down, and as men selected locally get more experience, and as local bodies get used to exercise the requisite control, works executed by them will reach, in the not remote future, the present standard. Both government and the public must, however, be prepared to make allowances for a little setback from the standard for some time, in the expectation that in the long run the improved methods will prove economical without leading to inefficiency. No account is taken in the above proposals of the educative effect of these reforms. Private enterprise is not sufficiently encouraged under the present system. It is not only possible, but very desirable, that the construction and

upkeep of certain classes of work should be given to private agencies or to local bodies. Road-making is a speciality to a certain extent, and unless the officer in charge of this branch not only knows his subject but has the requisite knowledge of the materials, metal, etc., required for road construction and repairs, and has interest in the work, really good roads cannot be constructed, nor kept in a fit condition. A separate branch of the Public Works Department must be created for this purpose, and not only provincial but important roads under local bodies should be placed under that branch, government relieving the local boards of the expenses in connection with the upkeep of these roads.

(2). Smaller works in the *mofussil* may well be handed over, as said in reply to (I), to the district board engineers, who, it is proposed, should work in consultation with the district local bodies.

(3). Work of a special character, such as that of reinforced concrete, should be given to approved firms on a commission basis. One of the reasons why such firms can do this class of work cheaper and better is that they have specialized in that branch and have trained experts to carry out their work. If approved firms are promised all work of a particular character they can easily get trained men from England and train local men in that branch of work. Such contracts should be for the whole work and not for portions only. These firms have an advantage over the Public Works Department of government inasmuch as they can dispense with the services of the 'inefficients,' while government will hardly do so, even if they can.

773. (III.) Changes in organization.—If the present policy of entrusting the execution of works to the Architectural Department is to be extended to the *mofussil*, it would be advisable to have three branches of the Public Works Department, viz., the Roads, the Irrigation, and the Architectural Department each under men who have specialized in that branch. This will prevent overlapping.

774. (IV.) Relations with other departments and sub-branches.—Complaints are often made by revenue officers about the Public Works Department not being very attentive to their proposals for the construction of small buildings, like schools and *chowkis*, under their

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charge. Some systematic co-ordination is necessary if the requirements of other departments are to be properly attended to.

775. (VIII.) **Practical training.**—Though the theoretical training received by the students at the Engineering College, Poona, is on the whole satisfactory, there is little practical training, and consequently most of the graduates require a sort of apprenticeship for a year or two before they feel confidence in themselves. This defect of practical training is felt by them more when they take employment under private firms than when they enter government or native state service, as in the latter case there is a fixed routine, which a new graduate can easily master, and also as his work for the first few years is neither arduous nor requires much initiative. In the case of private firms much more resourcefulness is expected from them, and new graduates find it difficult to give satisfaction to their superiors on account of their having received very little practical training at the college. Suggestions have been made before the Committee about the necessity of lowering the standard of entrance to the engineering college, and of reducing the theoretical training to the bare necessities of the case, and increasing the practical training, so that a man on completing his course and going out in the world feels confidence in himself and can properly carry out his duties as an overseer or a sub-engineer. On the other hand, there are proposals before the Syndicate of the Bombay University to improve the syllabus and extend

the period of study in the engineering college, but the new syllabus, I understand, does not provide for greater practical training. Both these proposals, if carried out in the spirit in which they are made, would lead to satisfactory results. The new sub-overseers, who will be recruited from the former class, will be more competent for their work and would be less discontented with their position. Similarly the new graduates will, in their turn, be able to do as good work as the men brought out from England. I do not mean to say that the best men of the college are in any way inferior to their English colleagues. One has to mention Sir M. Visvesvaya's name to give an idea of the innate capabilities of the class of men trained at the College of Engineering. What I want to bring out is that, under the new course with the added practical training, many more capable engineers will be turned out than at present. To carry out this ideal, government should take up every year the first three graduates instead of only the first one as Assistant Engineers and should also give a higher salary to the other graduates than they do at present, as that will attract a better class of students. The starting salary is now hardly more than what a capable *mistri* will expect, and it is no wonder if the graduate with the practical training feels disheartened if he is not offered much more than that. It may not be out of place to suggest here that if these proposals are carried out there should not be two separate services—the Imperial and Provincial—but all engineers should be classed in one service.

The HON'BLE MR. LALUBHAI SAMALDAS MEHTA called and examined.

776. (President.) The witness stated that he was Agent for the firm of Messrs. Marsland, Price and Co., Contractors, and controlled the finances of the firm. The technical side was conducted by the Manager, Mr. Mawson.

777. The present Public Works Department system was more expensive in the matter of establishment than it should be. The percentage cost of the departmental establishment for 1915-16 was 22½ per cent. but the total expenditure, he thought, included expenditure on works done by this agency for local boards. The firm allowed only eight per cent. on the cost of works for general supervision charges. This included the salary of the manager, the salary of the accountant and the salaries of the assistants working in the office, but did not include the salaries of the men actually employed on the works, i.e., the foreman and assistants engaged in supervision. It included the accounts establishment, and also something more which was not included in the Public Works Department percentage, viz., the interest on money. It did not include the remuneration of the firm's agent whose remuneration was 10 per cent. on the net profits with a minimum of Rs. 500 per month. This remuneration, however, seldom reached Rs. 12,000 per annum.

778. His suggestion that local bodies should carry out their own works, instead of having them constructed by the Public Works Department, referred only to the smaller class of works. Many of the district bodies would welcome such a system, especially those which had influence in the district and confidence in themselves, but probably others, which had no real control, would fight shy of it. It depended very much upon the men who managed the works, but he would advocate a beginning even though there was a likelihood of a set-back in the standard of efficiency in the earlier stages, and would push on with the system in the expectation that, in the long run, it would prove both efficient and economical. He admitted that he had not thought out, definitely, what small government works should be handed over to the local bodies but suggested that, in the case of schools for example, good type designs should be prepared and the work given to those local bodies who employed engineers competent to undertake their construction. Such buildings as outposts and police stations and registration offices, in outlying portions of districts, should also be made over to these bodies. Registration offices in large towns should be retained by the Public Works Department, as they were usually buildings of

considerable size. He had not considered the educative effect of his proposal but thought that it would be a step towards introducing one more department of local self-government. It would be an advance in the direction of increased control also, education in which respect was required if further powers of self-government were to be delegated in other departments of administration. There was some justification for the complaint that at present these local bodies, being manned by people who had no experience of this control, were given to nepotism and countenanced slackness. The Public Works Department should, therefore, be given some control over these bodies in order to ensure that they did their duty properly, and to bring them to book when mistakes needing correction occurred. The government control over the public works branch of district bodies would be accomplished, if government experts were sent out to advise on the construction of works. In the case of buildings he considered that, till government found that local bodies were able to construct their works properly, an annual inspection by government agency should be carried out. Powers of appointment, suspension and dismissal should be delegated to the local bodies, but, if government found through their inspecting staff that these bodies were abusing their powers, they should retain the right to withdraw these powers and to have their work done by the Public Works Department. Government had powers, under law, in regard to the approval of appointments and removal of engineers in the larger municipalities, and he thought that they should have similar powers in the case of local bodies.

779. Roads should be made the work of a separate department altogether, as he anticipated that, when architectural work extended to the *mofussil*, there would be a specialized department of architecture. Roads constituted special work, and should be constructed and maintained by a separate branch of the Public Works Department, since very few people took an interest in road engineering. If the roads were taken away from the local bodies they would have more funds at their disposal, but if this separate department were not created they should be left to the local bodies.

780. In view of the fact that in Bombay there were complaints that the work of the Executive Engineer and the Government Architect overlapped, he suggested that three separate Departments of Irrigation, Roads, and Buildings should be formed, and he believed that this

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scheme would prevent such overlapping. In order to provide scope for the three separate engineers (for irrigation, roads, and buildings) the present area of each district could be extended. He considered his proposal sound in principle as this was an age of specialization. If it was intended to restrict the Consulting Architect merely to designing the works, and then handing over the designs to contractors, or the Public Works Department, he did not desire any separation, but, if the object was to specialize in architecture and to train architects for this purpose in the School of Arts, government should, later on, hand over the construction of buildings to the Architects' Department and separate it from the other branches. It would not be sufficient to have special architects only for large cities such as Bombay, Poona, Ahmedabad and Karachi. He was not acquainted with government views on this subject, but, if it was intended that this specialized Department of Architecture should be instituted in the districts, he thought that the Irrigation Department should be made a separate branch altogether. So long as the Government Architect controlled the building operations of the Public Works Department he admitted that it would be a step in the right direction if his scheme were adopted only in regard to the big building centres such as Bombay, Poona, Karachi, etc., leaving buildings of no great importance scattered throughout the districts under the Public Works Department engineers. He added, however, that his suggestion was based on the hypothesis that the architect's sphere of action would be extended to the whole presidency. If, however, general public feeling and the views of government were against it, he was not personally prepared to press for the employment of architects throughout the presidency, or for the separation of the Irrigation Department.

781. He had worked out no figures in support of his suggestion that the charges under his reorganization scheme might possibly be very much larger. All specialization had drawbacks at first in regard to expense, but better efficiency was attained.

782. He recommended that the Public Works Department should endeavour to do more to encourage private contractors by giving out more works of a substantial size on contract, and not executing such works departmentally or by petty-contract because, at present, good firms would not come forward to take up work. Competent contracting firms would come forward to undertake substantial contracts if they had an assurance that government would give them preference over petty contractors, and government should give this assurance if they wanted first-class work to be done. He admitted that he might have been prejudiced by the information he had received that work carried out under the petty-contract system was usually not up to the mark, but he thought that the standard of work executed under that system depended mainly on the supervision exercised by the Public Works Department staff. With a competent staff who kept their eyes open better work was of course done, but this was not always the case.

783. He believed that the Public Works Department, and not the district bodies, undertook the construction of small buildings such as schools and *chowkis*. This was why he had stated in his written evidence that there had been complaints against the Public Works Department. He referred the Committee to Part 2 of the Land Revenue Report for 1914-15 where certain such complaints had been made.

784. (*Mr. Cobb.*) His firm's establishment charges were about 8 per cent. whereas similar charges in the Public Works Department were about 22 per cent. He had worked out the latter from the figures for 1915-16. It had been suggested to him that one reason for this difference of percentages was that the Public Works Department was unable to do away with the services of inefficient permanent employees. His firm gave their inefficient three months' salary in lieu of notice, as such men might let them in for a heavy loss. It depended on government policy what lines the Public Works Department should follow in order to get rid of men of this kind, and involved a much larger question than he could answer.

The grouping of districts together might do something to reduce this difference in establishment charges.

785. (*Rai Bahadur Ganga Ram.*) About 10 per cent. over and above the 8 per cent. establishment charges was usually allowed in the firm's tender for profit, but sometimes they accepted a profit of only 5 per cent. This 8 per cent. included the fees of the firm's buyers in England and also the interest on money used. When, however, there was less than the average amount of work coming to the firm their establishment charges ran up to 14 or 15 per cent.

786. He was under the impression that local board engineers took less interest in roads than in buildings because roads required more special knowledge, and his experience did not lead him to think that Public Works Department engineers took more interest in roads because they drew travelling allowance.

787. If a provident fund scheme were substituted for the present pension system, and power given to the Public Works Department of getting rid of an inefficient man on 6 months' notice as was now done by railways and certain large firms, he was afraid that the popularity of the service would be affected and was not sure whether the efficiency of the Department would be improved. He was informed that, in the Punjab, a large number of temporary men were employed subject to removal at only one month's notice, and that many of them spent all their lives in the Department; he considered, however, that men could not be expected to put their hearts into their work under such conditions. Young men did not, as a rule, leave the Department in order to take up private practice, as they had not had sufficient practical training. Even if they were given eight or ten years' practical training, and the option of leaving with the accumulation from their provident fund, they would require more capital to enable them to start as contractors. Certain engineers had, however, taken up private practice in Bombay as architects, charging a fee of about 5 per cent. on the work done by them. He thought also that it was possible that an experience of eight or ten years' service in the Department might accustom them to take things easily, which they would not be able to do in private practice.

788. (*Mr. Mackenzie.*) He had heard of the Madras system of local fund engineers for the road work in districts, but had not studied that system, and was therefore unable to express an opinion as to whether it would be successful if extended to Bombay. He was sure, however, that the engineers in Bombay were in no way inferior to those in Madras, and hence imagined that if this scheme were introduced it would be just as successful as it had been in Madras. Even at the risk of work not being up to the mark, he would advocate the transfer to local boards of the smaller public works in the districts.

789. With regard to the suggestion that all roads and buildings within a short distance of big centres should be entrusted to local boards, and that the Public Works Department should attend to roads and buildings in out-of-the-way and difficult places, he did not think that this would be fair to the Public Works Department. If repairs to government buildings were entrusted to local boards the work should not be given over to contractors for a term of years, as it was possible that a contractor might do only such work as was actually necessary and, after getting his money for a few years, leave the remaining portion for his successor to execute at a loss. He did not think that the revenue officials would have leisure to supervise the annual repairs to the buildings under their control, as he believed that they were already hard pressed with work and had a considerable amount of touring to do in addition.

790. Contracting firms would only undertake large reinforced concrete work in districts if they could get metal easily. His firm had, however, undertaken certain small works of this nature but had not made much money on it. They had undertaken works costing Rs. 15,000 and Rs. 20,000 at Baroda under the Gaekwar's government, and had repaired a bridge at Hyderabad with reinforced concrete, the latter having been work of an urgent nature.

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791. His firm employed only men from England who had gone through a three years' course of practical training.

792. Referring to engineers who had passed out of the colleges in India, he stated that if a practical course of training were given along with the college course it would not be necessary to give them a salary during the period they received the practical training, nor would this be necessary if they served after their college course as apprentices, and were not expected actually to do work. But if they were given work they would expect at least a subsistence allowance.

793. Unless the theoretical course in the Engineering College at Poona were reduced there would probably be very few students who would take advantage of a course of practical training, even if offered to them as proposed. After passing the matriculation, students entered an Arts college and after a course of one year there they had to put in three years in the engineering college. He had heard that there were proposals for extending this engineering course to four years. As there were very few students who could afford to pay a premium for their practical training, he considered it preferable that they should be given a living wage, but admitted that private practitioners would not pay such a wage unless they got some work out of the men. His firm had brought out two men from England without experience and had engaged them on a salary of £10 a month for a year or two, and after they had acquired practical experience and a knowledge of the language had raised this salary to Rs. 350 a month.

794. He was not well acquainted with the local fund engineering system for roads work in Madras, but wherever he had been in that presidency he had found the roads in an equally bad condition as in the Bombay Presidency, and doubted whether results had shown that there was any advantage to be gained from the system. He admitted, however, that he had only visited places in the vicinity of Madras.

795. (*Sir Noel Kershaw.*) In support of his contention that government departments should adopt means for getting rid of their inefficient, he cited the case of a man who had been engaged by his firm as foreman in their workshops. This man possessed the Manchester degree and had had practical experience, but, since it was found that he could not pull well with, and was not able to carry out the orders of, the firm's manager, his services

were dispensed with. In two or three instances it was found that, when the firm had dismissed inefficient, they had secured better employment under government. 33 per cent of the men engaged by his firm from England were found to be not up to the standard required.

796. The firm's procedure in connection with the selection of men from England was as follows:—

Their agents in England were asked to advertise, get applications, and send them out. Then the opinion of the firm's manager on each man was ascertained and put before the board with the applicant's testimonials and a history of what work he had done. More importance was attached to the kind of work an applicant had done than to his degrees, although the latter did count for something. All his men had English degrees except perhaps the Chief Accountant, who had done good work as a contractor's clerk of works. The firm required a degree which indicated some sort of university training, to which a certain amount of value was attached.

797. (*Mr. Kent.*) He thought that, if other departments had to undertake their own repairs to the buildings under their control, the system would be liable to breakdown unless they employed their own engineers, who would have to be almost as capable as the present sub-engineers or overseers of the Public Works Department. Such engineers would, however, be employed by the local boards, and hence the best plan would be to utilize their services thus getting the work done by a professional service.

798. Even if a local fund engineering department was started with the idea that they should carry out all local works, the Public Works Department, divided perhaps into three branches for Irrigation, Roads and Architecture as he had suggested, must continue to exist to such an extent as to enable it to undertake guidance and control. This Public Works Department establishment would be considerably smaller than at present, though it would not be possible to eliminate the Executive Engineers, who were the officers who would have to provide this control and guidance. The lower subordinate staff, however, could be eliminated altogether. He was unable to say whether the system suggested by him would be economical or not, but, if necessary, he would do away with every man under the rank of Executive Engineer. He was not in a position to say whether the number of Superintending Engineers could be reduced.

DURGDAS B. ADVANI, Esq., Architect, Engineer and Surveyor, Karachi.

Written Statement.

799. (I.) **Economy and suitability of methods of execution of public works and (IV.) Relations with other departments and sub-branches.**—The procedure in the stages preceding actual construction requires to be modified so as not to cover inordinately long periods of time, as it now does in many cases. I think the present machinery for making designs and for executing works to be too costly. For new works the estimate for the cost of making designs and for carrying out works is taken at 23 per cent. of the cost of the whole work. For works which government carries out on behalf of other bodies they charge the same percentage except in the case of local boards and in some instances the municipalities where a smaller percentage is charged. I consider 23 per cent. to be too heavy a percentage. The costliness of the establishment in its higher branches, and the centralized character of the huge organization account for this heavy expenditure.

800. (II.) **Encouragement of other agency.**—My opinion is that the work at present done by the Public Works Department in the Buildings and Roads Branch could be done by private agency. The work of preparation of plans and estimates and supervision could be handed over to qualified men by a system of competition. Offers for designs, estimates and supervision of works, or for repairs to existing works, in a sub-division, or a district, could be invited from qualified men whose names have been approved and registered, much in the same way as

is done in the case of contractors. The person whose offer is accepted will make plans and estimates, and will execute the work as he would do for a landlord. This method would give great incentive to private enterprise. Qualified men from Indian colleges would, I think, readily take up this work. The works can be carried out in their entirety by these men, and the Public Works Department will become a department of control and general supervision. The local boards and municipalities can, in like manner, get their work executed through this agency, subject to general oversight by the Public Works Department.

(2). With regard to the large cities, the extent to which private agency would be competent to execute works can be judged from the large private buildings in Bombay and in other cities, which have been designed by and constructed under the supervision of private architects.

(3). The system outlined by me could be given an experimental trial in some of the districts. Under this system a general reduction of the Public Works Department establishment will have to be made; the district units will have to be considerably enlarged. At present the Public Works Department does meet the needs of other departments, but it would continue to do so under the system advocated by me, through private agency.

801. (V.) **Decentralization.**—Certain recommendations of the Decentralization Commission seem to have already been given effect to, such as the enhancement

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of the powers of sanction in the case of local Governments. But further decentralization is necessary chiefly in regard to alteration in works in progress, and the acceptance of tenders for works sanctioned by higher authority.

(2). The powers of technical sanction in the case of Executive and Superintending Engineers should be increased. At present the limit of Rs. 50,000 prescribed for Superintending Engineers is not reached in practice. The amounts for passing tenders should likewise be raised.

(3). The extent to which decentralization can be carried into the subordinate grades also needs consideration. The powers of sub-divisional officers should be increased. It might become necessary in so doing, to raise the status of subordinate officers. There has already been a long-standing demand by these officers for betterment of their pay and status. Also, at present, a very small number of higher appointments is open to these officers. This number should be considerably increased.

802. (VII.) Education.—A good deal of specialization seems to be necessary in the collegiate courses. For example, a student who desires to qualify for a higher course in architecture is not at present able to do so. Similarly, higher courses of mechanical, textile and electrical engineering are not generally provided in the University Colleges of Civil Engineering. Generally speaking, the prospects for students passing out of the Indian colleges are lower than those to which the education they acquire should entitle them. I can quote the

instance of an Indian student who went out to England, after taking the textile diploma from the Victoria Technical Institute, Bombay, with the object of obtaining higher textile education. He went to the Manchester University, but found that if he joined the B. Sc. course of the Manchester University in textile, he would learn nothing more than he had done at Bombay. Passed students from this institute are able to obtain subordinate posts. They start with about Rs. 60 per month and rise on an average, I think, to Rs. 150. I consider these prospects to be incommensurate with the standard of education imparted to these students. The same may be said about the Poona College of Engineering.

(2). The question whether the colleges attract suitable students is bound up with the question of prospects. The Poona College offers the chance of only one appointment in the higher provincial service, and yet some first-class University graduates join the college. The competition for admission to this college is so keen that a restriction has had to be placed on the number to be admitted annually, which is at present forty. I think one appointment in the higher grades to be totally inadequate for this college.

803. (VIII.) Practical training.—Facilities for post-collegiate practical training should be provided in government or private workshops or on the works. It is needless to say that, in view of the improved prospects which such training would promise, the demand for it would be great.

MR. ADVANI called and examined.

804. (President.) The witness stated that he was an architect, and that he had been engaged in private practice in Karachi for about seven years.

805. He had received a college training, having passed the civil engineering course at the Karachi College, and has served for some seven years in the Public Works Department as an upper subordinate. On resigning this appointment he articulated himself to an architect who had formerly served in the Public Works Department as Executive Engineer, specialized in buildings, and later opened a business of his own in Karachi. He was not a Member of the Institute of Architects in England.

806. There were about six firms of architects in Karachi and their qualifications differed; two, which had only recently established themselves, had English qualifications, and two had Indian qualifications. There were also a number of small architects who were not fully qualified and who did only a very small business.

807. He had employed an L.C.E. who, however, had recently left him, and then another experienced practical hand as assistant besides an office staff. The number of clerks of works employed depended on the works he had in his charge. They were not permanent men, but rather of the *mistri* class and were taken on from work to work.

808. The fees charged by architects in Karachi depended on the nature of the works undertaken by them. There was no fixed charge, and the rate of the Institute of Architects were not followed. He thought that they averaged about 5 per cent. of the cost of the work, the fee including the preparation of plans and supervision of construction.

809. Under the system in vogue in Karachi the architect was responsible to the owner for the stability of the building and for the quality of the materials used for its construction. It was the landlord's part, if he desired the construction of a building, to see that he employed a proper architect. He was of opinion that the present system in connection with the construction of buildings by the Public Works Department was extravagant, and that 23 per cent. for the cost of establishment as provided in the Public Works Department Code was excessive. It was then pointed out to him that the actual cost of establishment in the Bombay Presidency averaged only 15 per cent. but he still thought this amount excessive and considered that 10 per cent. should be the maximum. He suggested that for the construction of buildings

government should wholly employ private architects; it would be cheaper and prove a great incentive to private enterprise. He had no remarks to offer, however, when it was pointed out to him that, in Bombay, the Government Architect designed and constructed buildings at rates cheaper than those charged by private firms in that city. On being asked whether, in the circumstances of the case, he thought it right that a government architect should be employed, he replied that it depended entirely upon whether government wished to encourage private enterprise or not.

810. He did not consider that the number of qualified architects in Karachi constituted a suitable field for competition, but was of the opinion that, with an increased demand for building work, there would be a corresponding increase in the number of architects. He himself had actually constructed some buildings for a municipality outside Karachi. If private architects established themselves in particular centres and were given the work in the neighbourhood, he thought that they would be ready to undertake the construction of such government buildings as police quarters, etc., even in villages 30 or 40 miles distant from a railway, as also primary schools scattered throughout the villages in Sind. Taking into consideration the government, municipal and local board work available in a *mofussil* district, there would, he considered, be sufficient work to justify the employment of an architect for such a district. The Karachi Municipality had recently invited competitive designs for a new building in that town and a number of architects had competed, including some from outside Karachi. He agreed, however, that the best policy for the Karachi Municipality to follow was to employ its own architect and builder. In connection with public competitions for the construction of buildings he proposed that the officer in control of the particular works should be the assessor. As a result of the adoption of such a scheme he considered that the Public Works Department establishment could be reduced and the district units considerably enlarged. A general oversight only would then be exercised by a superior engineer over the work of a certain number of private architects.

811. In regard to the engineering education of students he thought that there should be more specialization, especially in architecture. He was of opinion that these specialized courses could be more conveniently given in Bombay, not at the School of Arts as that school already

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[Continued.]

served its own purpose, but in an altogether separate institution designed for the purpose.

812. It was desirable that the prospects of the passed students of the various engineering colleges should be improved as the wages at present earned by them were insufficient considering the courses of instruction which they had undergone. He instanced the case of a man who, on passing his textile examination in the Bombay Technical Institute found, on going to Manchester University for higher training, that he had nothing more to learn there in the B.Sc. textile course, and yet the Bombay institute men started with about Rs. 60 a month. Government maintained at present a certain number of appointments connected with the textile industry, and he thought that they should give a limited number of such appointments to men who had received a practical training in the subject, thereby raising their status considerably.

813. It would be a good thing if practical training was insisted on in the case of each student turned out of the Poona College, and he suggested that the Public Works Department should be responsible for the practical training of all students from the various engineering colleges whether they intended to enter government service or not. From his experience of the passed students of the engineering colleges he was of opinion that they would be prepared to undergo a practical course of training if they were given a living wage of about Rs. 30 or Rs. 40 a month.

814. (*Rai Bahadur Ganga Ram.*) He held neither a University degree nor an architect's degree and was not an L.C.E. He worked with an architect, as a premium pupil, for one working season. He had obtained previous experience in the Public Works Department on various irrigation and building projects, and on the construction of different classes of works.

815. He believed that government gave their higher textile appointments to men returned from England, i.e., men who had received their general education in England and had also acquired their knowledge of textile engineering there.

816. (*Mr. Mackenzie.*) In connection with the encouragement of private enterprise, and to ensure qualified men from Indian engineering colleges obtaining employment, he was of opinion that government should take up the matter and create a demand for work which, in turn, would create the supply. There was such a large number of L.C.Es. turned out of the Poona College that restriction should be placed on the number of admissions. The yearly output of the Sind College was about four or five of whom practically all were employed by government.

817. (*Mr. Kent.*) He did not regret having resigned his appointment after serving for a few years in the Public Works Department, and thought that others who had received the same amount of training would do much better if they followed his example rather than continued in their appointments. He referred to his brother who was in receipt of a certain weekly wage in England, and who had taken his B.Sc. degree in electrical engineering and had received his practical training in one of the best workshops in Manchester. It was pointed out to him that, because of the scarcity of labour at the present time in England, boys of fifteen years of age and less were receiving thirty shillings a week even though they had no practical experience whatever. Asked whether his brother would have obtained an appointment on thirty shillings a week a few years ago, he said that, as far as he remembered, the office of the firm under whom he had received his practical training assisted him to obtain his present appointment.

818. He could not say that the supply of young engineers turned out of the Poona College would not, with the restricted number of admissions, be in excess of the demand, but he knew of a number of young men from that college who had remained out of employment for several years.

819. (*Rai Bahadur Ganga Ram.*) There was a system in force in Karachi under which architects were granted licenses at the discretion of the Chief Officer. His assistant held such a license and he had preferred him to hold it as he himself was a municipal councillor.

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[Continued.]

At Nagpur, Monday, 22nd January 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

C. S. COBB, Esq., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

G. A. DURIE, Esq., A.M.I.C.E., Superintending Engineer, Central Provinces.

D. G. HARRIS, Esq. (*Secretary*).

G. L. THOMSON, Esq., Superintending Engineer, Nagpur.

Written Statement.

N.B.—The views in this memorandum deal solely with the Buildings and Roads Branch of the Public Works Department in the Central Provinces and Berar.

820. (I.) **Economy and suitability of methods of execution of public works.**—On the assumption that no drastic alterations are to be made in the organization, methods and procedure of the Department, there is still scope for considerable improvement. I would preface my remarks by stating there is no room for further economy in rates of construction. Rates have risen, but not in proportion with the rise in wages and increased cost of materials, also supervision is better and there is less room for illicit profit by scamping. In fact the difficulties experienced in obtaining contractors rather points to the fact that rates are too low. I am aware there is widely held opinion that the Public Works Department is a most expensive agency for construction, an opinion I wish to challenge most emphatically, and I would welcome an inquiry from the leading gentlemen in Nagpur who have had occasion to employ private agency for construction as to whether they have been able to compete with the Public Works Department in quality and cost.

821. (II.) **Encouragement of other agency.**—The questions at issue can be broadly summarized under three heads :—

- (a) entrusting works and maintenance to private agency ;
- (b) the fuller employment of local bodies ; and
- (c) the reorganization of the Roads and Buildings Branch of the Public Works Department.

(2). I have no hesitation in stating in reply to the first question as to "entrusting works and maintenance to private agency ;"

- (1) that no such agency exists in these provinces ;
- (2) that if such agencies did exist, the result would not lead to economy.

(3). The conditions under which construction is carried out are far more difficult than in a European country, where the local resources are fully developed and the best possible materials of recognized quality are obtainable in the market. In the majority of cases it will be necessary to select your brickfield and to manufacture your bricks, to select your limestone quarry and to manufacture your mortar, etc., etc.

(4). I have not come across any private person or firm belonging to these provinces who possesses both the necessary capital and technical knowledge to undertake contract work as understood in a European country. The Public Works Department are thus perforce not only engineers, but also contractors, and have to supervise the arrangements for materials and labour, lay out the work, measure up the progress, and make out bills, and the so-called contractors are only petty contractors.

Even these petty contractors are obtained with increasing difficulty. A large majority carry out their work with borrowed capital, and the capitalists find it is more profitable to embark in trade than to finance building enterprises.

(5). The suggestion to employ private agency under government supervision means the introduction of middlemen working at a profit, in lieu of departmental control at cost price, and it is not possible for economy to ensue by such introduction.

(6). In my opinion, encouragement should first be given to the supply of materials by private agency. Lately a contract has been entered into with a firm for the supply of seasoned sawn teak wood scantlings in this circle, but I know of no other firm capable of supplying seasoned local wood. There is considerable scope for local enterprise in the manufacture of bricks, lime, supply of building stones, etc., etc.

(7). Some so-called decentralization has recently been effected in the Central Provinces by the handing over of the less important roads and more isolated buildings to the district local fund engineers for maintenance. It would appear that the proposal arose not so much with a view to decentralization of the Public Works Department, and the institution of a more efficient and economical method of carrying on the work, as with the view of placing sufficient funds at the disposal of the district boards to enable them to entertain better staffs, and more especially an efficient local fund engineer. Instead of handing over the roads and buildings to the district boards, and engaging a local fund engineer in an advisory and supervising capacity, the engineer was made an executive officer for the numerous districts in his circle and the provincial roads and buildings were handed over to him for maintenance, thus causing greater centralization instead of decentralization and imposing duties that were impossible to carry out with efficiency.

(8). In paragraph 746 of the Report of the Royal Commission upon Decentralization it is recommended "that routes of general trade or through traffic should be maintained by government, that main local roads should be a charge of district boards, that sub-district boards should be responsible for minor roads, i.e., those situated within the *tahsil* or "other sub-district area." This recommendation is not a sound practical solution, as it involves the touring of the district by three different staffs, and the employment of local contractors by three different agencies, entailing competition and scattered charges. Further, the same powers of reorganization and technical knowledge are required for the efficient maintenance of a main local road as for a main trunk road, and I see no valid reason for discriminating between the agencies for their maintenance. I would therefore advocate that the maintenance of all roads and buildings in any district should be entrusted to one agency.

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[Continued.]

either the Public Works Department or the district boards suitably constituted for the purpose.

822. (III.) Changes in organization and (IV.) Relations with other departments and sub-branches.—Two of the present defects of the Public Works Department administration are that the provincial and imperial branches work side by side with identical duties, on different rates of remuneration; and that highly trained Assistant Engineers are recruited, who, for the first few years of their service, have few opportunities of putting their advanced training into practice.

(2). The maintenance of roads efficiently and economically requires firstly, detailed supervision, secondly, methodical organization, and thirdly, a technical knowledge which can largely be obtained by practical experience; and it is frequently the case that a youth full of ambition to design and construct some monumental work, finding himself relegated to measuring up stacks of metal and paying coolies, loses interest in his profession and adopts an attitude of carrying on to the detriment of his efficiency and capacity for higher posts. On the other hand, the district boards in the Central Provinces have not so far been able to obtain a trustworthy staff capable of carrying out extensive maintenance efficiently and economically. Under the circumstances, I would confine the Public Works Department roads and buildings to a small *corps d'élite* consisting of a Chief Engineer and Secretary, with an Architect, Sanitary Engineer, Electrical Engineer, and bridge expert as his technical advisers in one central office. This staff with the necessary number of assistants should for the present prepare the designs and estimates of all important original works, and supervise the construction, and subsequently, as the province develops, their duties would be confined to passing projects by private agency and inspecting the construction on behalf of government. All the maintenance and construction of unimportant original works which will include buildings on standard plans should be entirely entrusted to the provincial or district staff.

The provincial or district staff should consist of a circle engineer under each Commissioner, an Executive Engineer to each district with an Assistant Engineer in all important *tahsils* or sub-districts, and a sub engineer in the less important *tahsils* or sub-districts. The Chief Engineer should periodically inspect the circle engineer's offices and see that the organization and administration of the circle is proceeding on proper lines.

(3). Salaries to be fixed for the posts held and promotions made entirely by selection from less onerous billets to the more onerous. Officers of exceptional merit in the provincial or district establishment could be enrolled in the imperial branch after a period on probation. Junior officers in the imperial branch should also do a turn of duty in the provincial, or district branch, so as to become conversant with the methods of construction prevalent in this country.

(4). There is no architectural staff in the Central Provinces and the appointment of an Architect for the province is most necessary. Executive Engineers and Superintending Engineers, apart from the lack of special training, have not got the time required to devote to this special branch.

Electricity is in its infancy in the Central Provinces, and unless it is desired to develop the latent powers of the rivers now untouched, the existing staff and its relations with the other sub-divisions of this branch of the Public Works Department are satisfactory.

As regards sanitation—on the one hand the community are not educated up to realize the necessity for any improvement, while, on the other hand, the province is handicapped by the absence of any officer who has specialized in this branch. The principle of carrying out sanitation works by the ordinary staff under the general supervision of a Sanitary Engineer is, I consider, suitable for the present.

823. (V.) Decentralization.—As regards departmental decentralization, though the necessity is nearly

universally acknowledged, the failure to put it into practice is, I consider, due to the responsible officers feeling that their staffs are not sufficiently efficient to be entrusted with enlarged powers. The improvement in the staff can be effected in the gazetted ranks by insisting on promotion by selection only from the commencement of their services. I consider the incremental system of promotion as a narcotic which tends to kill competition and encourages a spirit of minimum effort to avoid the withholding of the recognized annual improvement in salary. If the Executive Engineer and Assistant Engineer ranks were once more divided into three grades each, and promotions made from grade to grade by selection only and the undesirables weeded out, it would be impossible to find junior low-paid officers in the most important divisions and the senior highly-paid officers in the unimportant divisions. In the non-gazetted ranks the conditions of service should be considerably improved to attract men of higher social standing to compete at the training colleges.

(2). Further, in the Central Provinces, there should be an increase in the number of upper subordinates so as to allow selection for promotion to sub-divisional charge.

(3). As regards granting increased powers, there is not much scope for enlarged powers to sub-divisional officers, as it would not be fair to ask them to make final payments without granting them competent assistance to check the correctness of the accounts. Greater powers might with advantage be given to Executive Engineers and Superintending Engineers especially the former, the details of which are beyond the scope of this memorandum.

(4). I endorse the finding of the Royal Commission upon Decentralization as to the necessity for the revision of the Public Works Department Code which is both cumbersome and unduly restrictive.

824. (VI.) Simplification of procedure.—There is, however, room for economy in time and labour by decentralization, and simplification of procedure. This is not confined to the Department only, but extends to the other branches of the administration for whom the Public Works Department carries out work. For instance, the Public Works Department are called on for a stage I estimate for a building for another department. This, in due course reaches the head of the indenting department and is administratively sanctioned and is returned for the detailed drawings and estimate. The detailed drawings and estimate are countersigned by the local officer of the indenting department in token of his approval, and sanctioned technically by the engineer in whose powers the amount of the estimate lies, and is then once more submitted to the head of the indenting department for approval. It is frequently the case that this officer has changed his mind, or did not grasp the import of the stage I design, or finds he is unable to finance the project, and the Department are sometimes called on to revise the detailed project time after time. If it is possible to eradicate the submission of the detailed project to the head of the indenting department, and to limit him to the administrative sanction of the stage I estimate, more care would be taken to see that the stage I proposals fulfilled all requirements and alterations could be effected in this stage with the minimum of labour to the Public Works Department.

825. (VII.) Education.—The education in the Roorkee Engineering College gives a good general foundation and is sufficiently advanced for the rank and file; selected officers after a few years' service should be encouraged to specialize and to go through an advanced course, both theoretical and practical, in Europe.

826. (VIII.) Practical training.—The Apprentice Engineers posted to this province are given an adequate practical training to fit them to fill the post of sub-divisional officer, but I consider that when officers are approaching the time for promotion to Executive Engineer and Superintending Engineer, they should be encouraged to visit and write notes on important works under construction in India.

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[Continued.]

Mr. G. L. THOMSON called and examined.

827. (President.) The witness stated that he was a Superintending Engineer and that he had served 19½ years in the Buildings and Roads Branch of the Public Works Department. In Rajputana and Central India there, was no distinction between the Irrigation and Buildings and Roads Branches so that, while in Rajputana he had been in charge of both branches. He had had 5½ years' experience in the Central Provinces.

828. In the Central Provinces there were separate branches for irrigation and buildings and roads, and till quite lately there had been a separate branch for sanitation in so far as there had been a Sanitary Engineer whose works, however, were executed by the roads and buildings staff; the Electrical Branch was confined to an Electric Inspector only. The Irrigation Branch had only recently been established. It was originally manned from the buildings and roads staff, but at the present time officers were posted direct to it. As far as he knew the two branches were wholly distinct and officers were not transferred from one branch to the other except in special circumstances.

829. There were at the present time, he thought, ten executive charges in the Buildings and Roads Branch of the Central Provinces. Previously there had been twelve, but two had been closed during the war. The average area of an Executive Engineer's charge was 9,800 square miles, and it included more than one district. The average expenditure incurred by an Executive Engineer in the province in normal times was Rs. 5,00,000, and Rs. 7,00,000 in the larger divisions.

830. Contractors, as the word was understood in Europe, did not exist in the Central Provinces. The contractors available were all piece-work contractors who could not even set out their own buildings, could not measure up or prepare their own bills and a good many of whom could scarcely read drawings; all of them hence needed constant supervision. The Public Works Department had had experience of the employment of large contractors in connection with sanitary works and also in special matters like electrical installations, but not for the ordinary construction of roads and buildings. The large buildings in Nagpur had, he believed, been built by substantial contractors but this was before his time. So far as his own experience went, there were no large contracting firms available in the province, a few which had considerable capital being otherwise unsuitable for employment.

831. The system usually followed for the construction of works by the Department was as follows:—

First of all, when the estimates had been sanctioned, tenders were called for for the whole work. If a tenderer came forward and was accepted by the proper authority, he made his own arrangements, with a certain amount of assistance from the Public Works Department, for the requisite supply of labour and materials. The local officer then set out the work and the contractor proceeded. In the case of buildings, of whatever size, tenders were invited for the construction of the whole work. Occasionally works were given out in portions but this depended on the contractors tendering. Roads, as a rule, were divided up into sections and there was nothing to prevent a large contractor tendering for more than one section. Latterly no tenders for large buildings had been received at reasonable rates, with the result that the execution of such works had been carried out departmentally through petty contractors. He explained that, under this latter system, instead of paying a mason so much per day for his work he was paid on the amount actually done, the Department supplying all the materials. In such cases the petty contractor did not tender for the masonry work, but merely undertook to do the labour portion of it at a given rate. It was not really a system of contract at all but one of labour by piece-work. Having failed to get contractors to take up the construction of a whole building, the simplest thing was to deal with the labour direct. The system under which timber-work was given to a man of the carpenter class, and building work to one of

the mason class, had already been tried and found to be an improvement upon the existing system. This system would, he thought, be followed to a greater extent in the future as they had made arrangements in the Nagpur Circle for the departmental supply of all wood, and hence wood-work would in future be cut out of the tender leaving only the labour to be contracted for, for the supply of which a man of the carpenter class would probably come forward. In calling for tenders the rates included in the estimate for each class of work were disclosed. The contractor saw the abstract of the estimates and usually tendered at a percentage above or below the estimated rates.

832. He thought that a system of contract under which the rates for the work would be kept absolutely confidential and the estimates show only quantities would be hopeless. He explained that when he was in Amraoti one of the first things he had to do was to revise the schedule of rates. He called up a number of contractors in order to obtain information, and found that only one of them had the remotest idea as to the quantity of mortar required for 100 cubic feet of masonry. The witness did not see how such men could possibly tender unless they were given some indication of the correct rates.

833. With regard to the encouragement of a better class of contractors in the province, he thought that better men might be induced to come from outside if better wages were given to them, but a type possessing both technical knowledge and capital, which did not at present exist, would first have to be developed. In reply to a question as to whether there was anything in the system at present followed by the Public Works Department which discouraged contractors, he stated that he had it on hearsay evidence that unnecessary trouble was given to contractors by the lower subordinates, not so much in connection with supervision as in the matter of wilful delays unless a *quid pro quo* was given to make things run smoothly.

834. Contracts for the construction of roads were generally allotted in lengths of about four miles. For a heavy *ghaut* road the lengths would probably average three miles, while in the open country they would be a little longer. The amount of such a contract was about Rs. 30,000 including earth-work, consolidation and metalling. More contractors were available in the province for road-work than for anything else because earth-work, he thought, was more paying and admitted of a larger margin of profit than building work, especially if strict supervision was not exercised. There was nothing to prevent a contractor from taking over two or three sections of a road if he so wished, and the Department would agree, he thought, if they found the man capable.

835. The maintenance and repair of buildings were classified as *pucca* and *kutcha pucca* and there were less *pucca* buildings and as a rule a fixed percentage on the capital cost was allowed. For *pucca* residential buildings one per cent. on the capital-cost was allowed for repairs, and ½ per cent. was allowed to accumulate for special repairs, which later amount need not be spent in any particular year but was carried on over a series of years. The whole of such maintenance was in the hands of the Executive Engineer.

836. The lump sum grant made over to an Executive Engineer for repairs could be spent by that officer subject to certain restrictions. The allotment for repairs was divided under three heads, annual, periodical and occasional. The annual repairs were those done every year without any alteration, such as inside colouring and whitewashing, oiling of wood-work on buildings, and spreading sand on approach roads. The allotment for this first head was fixed. Under the second head, periodical repairs, such as painting a building once in six years, the engineer got one-sixth of the amount every year for each building, and he had to arrange his programme so that he did one-sixth of all the buildings in his charge every year. The allotment for occa-

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sional repairs consisted of the balance between one per cent. and the total of the allotment for annual and periodical repairs. These repairs were those for which it was not worth while framing an estimate, but the Executive Engineer could not exceed the one per cent. limit.

837. The sum allotted for repairs to each particular building was based on standard estimates and the Executive Engineer was not given a lump sum grant. For annual and periodical repairs an Executive Engineer was tied down to fixed allotments, but he was allowed a certain amount of scope with regard to occasional repairs; even for this, however, he was limited to the extent that, if year after year he spent more than one per cent. on a particular building, the rent of that building would have to be increased. He was permitted to utilize the savings on one building on repairs to another. The rent of a building was not revised if the sum expended on repairs exceeded one per cent. in any particular year, but only if this allotment was exceeded in a series of years.

838. In most places in the Central Provinces repairs were done by means of petty contractors, but at headquarters a good deal of departmental labour was employed for such work, the former method not being popular owing to the difficulty experienced in getting reliable contractors to take up repair work. He explained that contractors often sent in petitions complaining that the tenants gave them trouble by sending their *coolis* away on the ground that the time chosen for repairs was unsuitable.

839. The procedure in regard to road maintenance was as follows. In the first instance, the life and cost of annual renewals was found from actual experience and failing that was based on the heaviness of the traffic, nature and width of metal, etc., and the period varied from four to ten years. Then the cost of the maintenance gangs was estimated, which amounted usually to about a hundred rupees per mile for a first-class road, and after this the cost of maintenance of bungalows, river crossings, and any special subsidiary works was added. On the whole total the cost of road maintenance was based and reduced to a fixed rate per mile. The entire sum was handed over to the Executive Engineer if the budgetted amount permitted, and that officer then prepared the various detailed estimates himself, obtaining the approval of the Superintending Engineer in cases where the detailed estimate for a road exceeded the standard estimate by more than 5 per cent. The Executive Engineer had full powers over the maintenance grant for roads, and obtained sanction only to the contractors' agreements. The renewal of coats of metal on particular lengths of road was done by petty contractors, all materials being supplied by contract, but the rest of the annual repairs were done by small departmental maintenance gangs who were retained throughout the year. Contracts were not made, however, for the actual work of consolidation as this depended largely on the weather. In the case of metalled roads the actual consolidation by steam rollers was carried out departmentally, but piece-work contracts were made for picking up the old surface, and spreading the renewal metal, and for numerous roads the consolidation by bullock rollers was generally carried out by contract. With a plentiful rainfall consolidation could be done cheaply but with a scarcity of rain it was expensive, and therefore no benefit accrued by tying the contractor down. As a matter of fact, in the case of road maintenance, the annual contract entered into was usually one for the supply of metal, the whole of the actual consolidation and other petty repairs being done departmentally. He considered this to be the best system, but saw no objection to a reliable contractor being given the maintenance of a road provided that such a contractor were tied down to a period of years, he doubted, however, whether this class of contractor was available. Such a system would lessen the amount of Public Works Department establishment now required for supervision by reducing the number of sub-oversers, mates and time-keepers. (A *mate* in the

Central Provinces was the head of a gang of *coolis* and his position corresponded to a *mi-tri* in other provinces.) He suggested that the contractor should be bound for a term of years because, even if he scamped his work in the first few years, it would not be profitable to him, eventually, if a fairly long period were fixed, as the life of a mile of road depended a great deal on the consolidation and quality of metal used.

840. It was considerably more difficult to get contractors to take up building work scattered over a large area, in a district than was the case with buildings in towns. The only increase in rates allowed in the former case was for carting.

841. There was a schedule of rates in force in the Public Works Department in the Central Provinces which had been revised some four years ago from beginning to end, and which could be revised, with the approval of the Chief Engineer, if at any time an Executive Engineer was dissatisfied with a certain rate. This schedule was revised from time to time on the basis of the actual cost of materials in each locality and the actual current rates for labour. The total amount of labour required for each item was fixed for the whole province, for instance, if for 100 cubic feet of work four masons were required this number was considered as constant throughout the province, although the pay of the men employed varied considerably. In framing this schedule the actual cost of building work in the previous year was not taken into consideration.

842. The opinion he had expressed that the work of the Public Works Department was economical was based on the fact that when, at the instance of the Government of India, the question as to whether rentable buildings could not be built more economically had been taken up, his predecessor had made inquiries from local people in Nagpur and had been informed by them that they could not compete with the Public Works Department, which fact he had duly reported. He had never made a comparison between the rates paid by private persons for masonry and those paid by the Public Works Department. He did not know what private people paid but, on one occasion, he had been taken by a certain individual to see some masonry he was doing and had found the work infinitely inferior to that of the Public Works Department. The rates paid by district boards used to be cheaper than those of the Public Works Department, but at the present time he understood these boards, as well as other local bodies, had adopted the Public Works Department rates. The rates of the Bengal Nagpur Railway used to be higher than those of the Public Works Department but had since been reduced.

843. He did not consider the present departmental specifications unduly high in the case of permanent buildings.

844. He could not say definitely what the percentage charges for establishment amounted to either in the Central Provinces as a whole, or in his own circle, but thought that they were 20.9 per cent. last year for the whole province.

845. Municipalities, in connection with their own work, could seek the advice of the Executive Engineer at any time. Larger municipalities, however, had their own engineers, but as a rule, an Executive Engineer was an *ex-officio* member of a municipal board. Municipal plans and estimates had to come before the civil authorities who, in some cases, consulted either the Executive Engineer or Superintending Engineer before according their approval, as the powers of such bodies were very limited, and estimates for waterworks required the approval of the Sanitary Engineer. He believed that the limit fixed was Rs. 1,000. He was doubtful as to whether the plans and estimates of municipal school buildings, etc., had to be approved by the Superintending Engineer in the Nagpur Division, as he was unable to recall any instance of such plans being submitted to him. He knew, however, that when he was Executive Engineer in Berar all such plans and estimates had been approved by him. The

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plans and estimates of district board works exceeding Rs. 5,000 were sent to the Superintending Engineer. Certain plans and estimates for district board works had formerly been submitted for approval to the Executive Engineer, but he believed this was no longer the case since the appointment of the divisional local fund engineer.

846. The engineering staff of district boards consisted of a district engineer of the supervisor grade and a divisional local fund engineer in each Commissioner's circle. The grade of these district engineers corresponded to that of an upper subordinate of the Public Works Department, while the status of the divisional local fund engineer corresponded to the grade of Assistant Engineer.

847. The system of divisional local fund engineers for local bodies had led to extreme centralization in the Central Provinces. These bodies had made this local fund engineer, who was in charge of very scattered work in five districts, personally responsible for the whole work, i.e., they tried to make him an executive officer in five districts at once. The Berar system was far superior, in that, in that division this engineer was relieved entirely of his accounts and was really an advisory officer, not responsible for the actual execution of works, but a consulting engineer in regard to plans and estimates and an inspector of works in progress. He also signed completion certificates and wrote inspection reports. The charges of the other divisional local fund engineers were too large for efficient working. The system led to overlapping of the duties of the Public Works Department officers and those of the local fund engineers, in that one had often to traverse the roads maintained by the other in order to get to his own work and both had usually a few buildings in their charge in the same place. Instead of each having separate areas they were each responsible for scattered portions of the same area. To remedy this state of affairs the witness considered that all roads should be entrusted to a single agency which, he thought, should be that of the local bodies provided they were given a better staff than they had at present.

848. He proposed that local bodies should not only construct and maintain the small buildings required by themselves but should also construct and maintain similar buildings on behalf of government, and should even construct more important government works under supervision. All roads, whether provincial, district or otherwise should, he thought, be made over to district boards. For the Buildings and Roads Branch of the Public Works Department a small imperial service of specialists with assistants should be constituted. He thought it advisable to bring all these specialists under one head, i.e., the Chief Engineer and Secretary to Government. The duties of this staff would, in the first instance, be to prepare estimates for all the more important original works whether required by government or by local bodies, and to supervise the construction of the same, but they would have nothing to do with accounts or with the engaging of contractors. This staff would form a corps of inspectors of works, and would carry out inspections during the construction of works by the local board in the same way as an architect carries out inspections of buildings under construction, and in addition they would be responsible for the preparation of plans and estimates for large projects. He thought this would prove a satisfactory system for the Central Provinces, and that the roads and buildings would be properly constructed and maintained thereby. He explained that the reason why he had suggested this system was that at present a very large proportion of the engineer's time was spent in doing work which a less highly trained officer could do, and the policy of making an officer jack of all trades seemed to him to be a false economy. It was wasteful to entertain a highly trained engineer and to give him work 90 per cent. of which could be done by a less qualified officer. It would, therefore, be better to have fewer highly qualified engineers and to keep them solely for the more difficult

technical work, devolving less technical work onto less highly trained officers.

849. His scheme contemplated a separate engineer for each district to be maintained by the local bodies of that district. Each of the circle engineers should receive a salary rising up to a maximum of Rs. 1,500 per month, and should be given the status of a provincial service Superintending Engineer and be maintained by the provincial government. The status of the district or Executive Engineer under his scheme would be the same as that of an Executive Engineer of the provincial service, whose salary was about two-thirds that of the imperial Executive Engineer, and he would also have an Assistant Engineer in charge of each of the more important *tahsils* or *talukas*. It was pointed out to him that whereas at present the Buildings and Roads Branch of the Public Works Department in the Central Provinces consisted of ten Executive Engineers, two Superintending Engineers and five divisional fund engineers, making a total of seventeen officers, his scheme contemplated five circle engineers, twenty-two Executive Engineers plus an imperial staff to supervise them or an increase of 75 per cent. The witness was, however, still of opinion that his scheme would prove economical and explained that it was a mistake to judge economy by the percentage of establishment charges which figure gave little idea of the true cost of such establishment. The question to be considered was, whether by having better supervision it was not possible to save the equivalent or more. Expenditure was increasing very greatly in the Central Provinces, and he considered the present Public Works Department staff absolutely inadequate. As the amount of work varied in different districts, Executive Engineers should be promoted from billet to billet. Their pay, however, would remain the same in each billet.

850. The district local bodies' establishment should be entirely under the district local board except the circle engineer who would be under the Commissioner. Recruiting for this service could possibly be done by the circle engineer, but the filling of the actual posts might be left to a great extent to the district boards, i.e., they could choose their own engineers from the existing district engineers. Beyond the fact that these engineers would be servants of the district board and not of government, he had not thought out the details of his scheme and was not able to say whether he recommended a general combined list forming one service for the staffs of all the districts or a separate service under each district.

851. Under his scheme government control over the funds expended on its behalf by these district boards would presumably be secured by having the accounts audited by some public official. He did not consider that any further precautions were needed than were at present considered adequate. If government were dissatisfied they could withdraw the powers delegated to district boards and take back their own buildings and roads or else appoint a private agency to do the work for them.

852. The inspection of works would be carried out by the circle engineer, who would be selected from amongst the district engineers by the Commissioner; such an officer would be capable of seeing that the roads were properly maintained. The Commissioner would have full powers over the district boards, the circle engineer acting as his adviser in connection with all matters relating to public works, and the Commissioner being given power to deal with instances of bad work reported to him by the circle engineer, although not to the extent of actually fining district boards. He did not contemplate any control over this district board staff by the Deputy Commissioner.

853. He had not had any experience of famine in the Central Provinces nor in other British territory, but had had such experience in Rajputana and Central India. In the case of famine occurring after the introduction of his scheme, though it would still be necessary to have a central authority to see that famine programmes were drawn up, the actual preparation of plans and

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estimates would devolve on the district board staff, and each district staff would, he considered, be able to manage famine works in its own district. Government should have power to requisition, in the case of famine, the whole of this district board staff for famine work. He could not say, in view of his lack of experience, whether this would constitute a satisfactory organization.

854. If his scheme was not adopted and the present organization of the Public Works Department continued, he recommended the appointment of an Architect for the Central Provinces. He considered that no matter how small the amount of building work in the province was, an Architect should be appointed, and he believed that there was certainly enough to keep such an officer fully employed. He had no knowledge of any private architects in the Central Provinces at the present time.

855. He did not agree with the contention that the Roads Branch of the Public Works Department should be separated from the Buildings Branch as this would lead to overlapping, but was of opinion that, for construction only, a separate Architectural Branch should be created. These Architects would undertake the preparation of all standard designs and be available for consultation when necessary.

856. He did not know of any building centres in the Central Provinces of sufficient importance to justify a separate building division to which an Architect could be appointed instead of a civil engineer of the Public Works Department, but remarked that requirements varied a great deal; there might for a short period be sufficient building work in Nagpur, for example, to justify the employment of a whole-time Architect, but as a rule this was not the case. The Architect he had suggested would be really a Consulting Architect who would be concerned with the designs of buildings in the province but not with their actual construction which would continue to be carried out by the present staff. This officer would also inspect works from time to time to see that his ideas had been carried out and might, if he thought fit, suggest alterations.

857. For the appointment of Sanitary Engineer in the Central Provinces, now in abeyance, the officer who was considered best fitted for the post had been selected from amongst the most senior engineers. So far as he was aware no special training was demanded as a qualification, although he recollected two cases in which the officers who filled the post had gone through a course of sanitary engineering in England. He did not think that the system was suitable and suggested that it would be preferable if a man who had specialized in that branch of engineering from the beginning of his service were selected. An officer who had not considerable experience of sanitary engineering in India should not be appointed to the post. Junior men should be employed as assistants to the Sanitary Engineer and when such an appointment fell vacant the best junior man, not necessarily in the province, should be selected to fill it. He thought that in a few years there would be quite enough work for a Sanitary Engineer and an Assistant Sanitary Engineer in the Central Provinces.

858. He admitted that there was not sufficient work at the present time in the Central Provinces to justify the appointment of a whole-time bridge expert, but considered that there ought to be one, as the bridges in the province wanted developing and the construction of a great many more bridges was needed. Hitherto it had been the practice in the Central Provinces not to bridge large rivers, but this policy was mainly due to the want of funds, and he thought the time had now come when such rivers should be bridged. This bridge expert would not be required to construct ordinary petty bridges over small rivers and streams, but only to design bridges over large rivers.

859. He had recommended in his written evidence that, in order to improve the existing organization of the Public Works Department, promotion should be given more by selection than was the case at present and that the time-scale should be abolished. He was unable to state definitely how long that scale had been in force but was under the impression that it had been

in existence for some eight or ten years, nor could he say whether the efficiency of the Department had decreased during that period, as he had been in Rajputana and Central India where the establishment was very limited and recruited entirely from men not required in other provinces. He thought, however, that the existing conditions were decidedly bad, and attributed this state of affairs to the time-scale as, under it, there was no scope for giving a man accelerated promotion for good work and holding back a man who did not exert himself. There was an efficiency bar in the time-scale, but, in practice, this was not exercised unless a man had done very badly indeed, and an increment could be withheld at any time. Although a man had to be certified fit before being promoted to the rank of Executive Engineer, he was under the impression that practically every man got his increment and was promoted to that rank. He considered that the fault lay in the practice but was encouraged by the system and admitted that the responsibility for the practice lay with the Department itself. The Superintending Engineer did not promote officers but only certified whether they were or were not fit for promotion to executive rank. Actual promotions were made in the Secretariat by the Chief Engineer who, however, had not an unfettered hand in the matter, but was subject to the control of the Chief Commissioner. He had not enough knowledge of other departments, where the time-scale was in vogue, and so could not give an opinion as to whether those departments also suffered in the same way by the promotion of inefficient.

860. Confidential annual reports on the work of Public Works Department engineers were made out by the superior officers of that Department, but the Deputy Commissioner or Commissioner did not see these reports, or give any opinion on the work of the engineers in question. He did not consider that the Deputy Commissioner or Commissioner were in a position to give an opinion on the technical aspect of an officer's work, although they might perhaps be allowed to have a voice in connection with the selection for promotion of an officer, from other points of view, as was the case in other departments.

861. He did not agree with the suggestion that the position could be remedied to a certain extent by making the Executive Engineer an assistant to the Collector in the same way as forest and medical officers were at present, as the position of the Executive Engineer was not on a par with that of these officers. The forest officer was generally confined to one district whereas the Executive Engineer in the Central Provinces had three, and the former officer was engaged in revenue matters with which the Deputy Commissioner also was intimately concerned. As regards medical officers, he had never understood why the Deputy Commissioner should report on them. He was opposed to the proposal that, in order to ensure better organization and efficiency, the Public Works Department should be brought into closer relations with other branches of the administration and especially with the head of the district, and explained that he saw no reason why closer relations should not be established without the Executive Engineer being subordinated to the Deputy Commissioner. It was not unusual at the present time for the Executive Engineer and Deputy Commissioner to tour together and settle their requirements as they went along without one being officially subordinated to the other.

862. He did not object to the present method of obtaining administrative sanction, but thought that this sanction once accorded should be made more binding. He agreed that there was justification for the complaint that the plans and estimates prepared by the Public Works Department for works for other departments were frequently altered so that the former had often to revise and re-revise its estimates several times. He considered that other departments should be bound strictly to the original administrative sanction which had been obtained at the first stage, and should not be permitted to demand alteration afterwards. When ad-

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ministrative sanction was given at stage I of the plan and estimate it should then pass out of the hands of the head of the department altogether, but not necessarily out of the hands of the local officer of the department. This latter officer would then be able to settle any slight alterations required on the spot. In this way the work would be more satisfactory, since the head of the administrative department concerned would be forced to examine them at stage I more carefully than he did at the present time. Changes in plans and estimates, with the exception of standard plans, were the rule rather than the exception at the present time.

863. Referring to his remark regarding decentralization in his written evidence, to the effect that the failure to put it into practice was due to the responsible officers feeling that their staffs were not sufficiently efficient, he explained that this was the main reason why there had not been more decentralization in the past. He was in favour of further decentralization, especially to Executive Engineers provided that adequate selection was introduced.

864. Under his powers as a Superintending Engineer he could give technical sanction to ordinary works up to a value of Rs. 25,000 and up to Rs. 50,000 for works on a standard plan. He thought these powers should be increased to Rs. 50,000 for ordinary works and should be unlimited in the case of standard plans.

865. Executive Engineers could sanction works up to a limit of Rs. 2,500. He thought that these powers should be enlarged and suggested that they be given powers up to Rs. 10,000 for original works not constructed on standard plans. He would not, however, lay down that every Executive Engineer should have these powers, but would give the local Government discretion to delegate authority to individual Executive Engineers as they thought fit.

866. He did not recommend any increase of power to sub-divisional officers as he did not think it was fair to give them powers unless they were also given a staff to help them. At the present time the sub-divisional officer had no accountant who could check his final bills for example. Sub-divisional officers made payments on final bills up to Rs. 200 but had no powers of technical sanction.

867. He allowed 5 per cent. in his estimates for contingencies; this he considered was sufficient for buildings and was not so inadequate as to lead to the necessity for the preparation of revised plans and estimates and unnecessary applications for sanction. For roads, however, this percentage might, he thought, be increased to 10 per cent. as no one could be absolutely certain of his facts when drawing up plans and estimates of this nature. He did not, as a Superintending Engineer, get any discretionary grant for new construction, but there was such a grant under 'special repairs' and 'tools and plant.'

868. He thought that Commissioners and Deputy Commissioners occasionally gave Executive Engineers very small amounts as discretionary grants for minor works. These Executive Engineers, should also be given a discretionary grant for petty improvements to roads.

869. The money limit for a minor work in the Central Provinces was Rs. 5,000. He was of opinion that this should be increased to Rs. 10,000. He believed that this would simplify procedure as, though minor works were sanctioned more easily than larger works, they were as a rule more difficult to finance. This increase from Rs. 5,000 to Rs. 10,000 would, he thought, constitute an improvement in the administration of the Department.

870. He believed that the rules regarding the purchase of stores were unpopular in the Central Provinces, but did not wish to criticise them as the present system seemed to work all right. The rule under which certain stores had to be obtained through the Secretary of State did not hamper the working of the Department, as the engineer was given fairly wide discretion as to local purchase provided prices were favourable. The existing rules were, he thought, sufficiently liberal and he did not desire that they should be relaxed.

871. The Superintending Engineer appointed all lower subordinates, both permanent and temporary, in the lowest grade, but promotion above this was made by the Chief Engineer. As regards temporary establishment the Superintending Engineer had power to make appointments up to Rs. 120 a month. The lower subordinates appointed by that officer had to be passed students of an engineering college. The Superintending Engineer had full powers over temporary staff whose pay did not exceed Rs. 120 a month, and over 3rd grade sub-overseers on the permanent staff, but that officer had no powers over temporary staff whose pay exceeded Rs. 120 a month, nor over permanent staff above the rank of sub-overseer, 3rd grade. An Executive Engineer could appoint or dismiss temporary men under a certain pay, but had no such powers in respect to the permanent staff. He did not recommend any increase in the disciplinary powers of Superintending and Executive Engineers, as the whole of the staff was on one list, and hence he thought that it was a little difficult to delegate powers of reduction and promotion since this would cause inequalities in the rates of promotion and reversion. He was not aware that powers had been thus delegated in other departments. Looking at the question merely from the point of view that Executive and Superintending Engineers had trouble in getting rid of their inefficient staff by the fact that they were not given the necessary disciplinary powers, it would certainly be an improvement if such powers were delegated to them.

872. The accounts system was very complicated, but he thought that, in practice, an Executive Engineer very often signed his accounts without wasting much time over them, relying upon the efficiency of his accountant for their compilation. The engineer, however, had to look into the initial accounts in detail. He was in favour of the proposal that the Executive Engineer should have nothing to do with the compilation of accounts and that the responsibility for their compilation should devolve wholly upon the accountant. This system would, he thought, constitute an improvement in organization.

873. The present system of audit led to a large number of references and caused unnecessary trouble and work to the staff of the Executive Engineer. The actual percentage of payments brought to notice by audit as really objectionable was very small, but audit objections ran into large sums when they were due to faults in procedure such as expenditure without estimate or excess over allotment. The present system of accounts had a tendency to take up so much of the time of an Executive Engineer that that officer's executive work was seriously interfered with, and it was in this respect prejudicial to the work of the Department.

874. There was no system of travelling audit in the Central Provinces, but merely a yearly inspection of divisional offices by Comptrollers and Examiners of accounts. Audit was done on the monthly accounts, and when he made his annual inspection the Examiner took up one particular month and test-audited the accounts of that month in detail. He did not see any objection to the introduction of a system of travelling audit, under which a staff of travelling auditors would visit the Executive Engineer's office and audit that officer's accounts on the spot.

875. There was a school of engineering in Nagpur which had recently been started for the training of lower subordinates. The upper subordinates employed in the Central Provinces were usually recruited from those who had passed out of the Roorkee College. The training given to these upper subordinates in the Roorkee College was quite satisfactory, but he thought that they ought to be given more opportunity of specializing. After a period of service, men who had done well might be given an opportunity of going through a further course, in other words he recommended a scheme for study leave similar to that in force in other departments.

876. He was of opinion that the course of theoretical training given at Roorkee for lower subordinates (although not for upper subordinates) was more advanced

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than was required for the class of work they were called upon to perform. This theoretical course should be considerably reduced in the case of lower subordinates and more practical training given to them.

877. He was in favour of the proposal that lower subordinates should be largely, if not wholly, abolished and that in their place more men of the *mistris* class should be recruited. It would be a decided improvement if practical *mistris* replaced the sub-overseers at present recruited from college. He did not consider that trained sub-overseers were needed to assist in the preparation of plans and estimates which *mistris* were not competent enough to undertake, and thought there was too great a tendency at present to indent on lower subordinates for the preparation of plans and estimates which ought to be prepared by more senior officers. A subordinate should be constantly supervising his work, and not sitting in an office making out estimates. He was in favour of the proposal that there should be a radical reduction in the lower subordinate establishment, and that *mistris* recruited from practical craftsmen should be substituted for the present staff.

878. (*Sir Noel Kershaw*). *Mistris*, now-a-days, had sufficient education to enable them to understand their work and to read plans. It would be a great advantage if they had a more general education although he feared that it might tend to spoil them. He agreed that education ought not to spoil practical men, but there was a tendency for it to do so in this country.

879. The system of travelling audit would be an advantage in that it would reduce correspondence considerably by enabling the Executive Engineer to settle most of the objections with the travelling auditor on the spot, and it would be an additional advantage if it were not performed so frequently, as he considered that the monthly audit at present in force was unnecessarily frequent. Though this was introduced for the immediate detection of faults he did not think that its cost was justified by the assurance of early information, and considered that there would be little loss of efficiency if it were done at less frequent intervals, say quarterly. In many cases objections would disappear automatically during the periods between audit.

880. In regard to the primary accounts, the Executive Engineer should be responsible for the correctness of all payments and allocations, but the actual compilation could be done by an accounts officer. The Executive Engineer would indicate to the accounts officer to which particular work each item should be allocated.

881. He admitted that the fact that there were very few Assistant Engineers in sub-divisional charges and that of the number of upper subordinates holding such posts a certain proportion were really lower subordinates, constituted the chief reason why he did not advocate any increase in the powers of sub-divisional officers.

882. At the present time, officers and subordinates in sub-divisional charge made all running payments on sanctioned works, the accounts for these payments being managed by the sub-divisional officer with the assistance of his clerks. The sub-divisional officer was not allowed to make final payments which had to go for verification to the divisional office. There was, as a result of this system, delay in making the final payments, but he did not think that this was any hardship as the contractor would already have been paid nine-tenths of the amount due for his work on running bills and there would only be one-tenth outstanding. The delay due to this procedure did not usually exceed a month.

883. If local Governments were instructed to delegate further powers to Superintending and Executive Engineers, he believed that they would use their discretion more largely in regard to the promotion of such officers than at present, which would be an advantage. In regard to the control of local board works he did not think that there would be any advantage in withholding payments due on other accounts, as local boards in the Central Provinces had very small funds of their own. He suggested that if anything went wrong government should depute a special officer in independent charge to put things right, thus punishing the local boards to the

extent that they would lose in prestige on account of not being able to manage their own affairs. He admitted that he relied for the success of his scheme on the prestige of these local bodies and on the fact that the local board engineers would be aware that their salaries depended on their work being done satisfactorily. The only other means of safeguarding itself would be for government to retain power to withdraw the powers delegated to local boards.

884. He had full powers as to the appointment and dismissal of temporary men, but in regard to permanent men he could only recommend their dismissal. He had had occasion to recommend that Assistant Engineers should be passed over for promotion, but his recommendations had not always been acted upon. He agreed that Chief and Superintending Engineers had less opportunity of knowing the qualities of an Assistant Engineer than the Executive Engineer had, but the final decision as to the supersession of an Assistant Engineer rested with the Chief Engineer, the charge sheet in this connection passing through the hands of the Superintending Engineer. The Chief Engineer did not always accept the views of the Superintending Engineer, if he considered either that the punishment was too severe or that the fault had not been proved. No disciplinary action could be taken without a charge sheet and a written defence by the officer accused, and he explained that it was often rather difficult to prove a charge in writing against an officer. Faults were condoned too much at present, a fact which was attributable to a great extent to the practice of not exercising sufficient selection. He thought that this practice was, in some cases, due merely to tender-heartedness and there was always a tendency on the part of the Chief Engineer to hesitate in the case of dismissals, since no pension is given for short service, and the officer dismissed probably had only a small sum to his credit in the provident fund.

885. The average value of the major building works carried out in the Central Provinces in the course of a year was between Rs. 12 and 19 lakhs. The Government Architect whose appointment he had suggested would receive a salary of Rs. 1,000 rising to Rs. 1,500; he did not think it would be possible to secure the services of a competent man on less than this figure. He did not approve of the proposal to give the Architect 2½ per cent. of the cost of each work, and to instruct the Executive Engineer to see that the buildings were erected in accordance with the Architect's designs, as the latter should visit the works during construction and thus have an opportunity of making alterations if he so wished. It was possible to alter the appearance of a building, in regard to minor details, even after its construction had been commenced. The Public Works Department budget grant was not a stationary figure in the Central Provinces. In the last few years it had been quadrupled, and he presumed that in a few more years it would be quadrupled again. Therefore, if an Architect could be secured with good Indian experience and a knowledge of local conditions, there would be plenty of work for him in time. At present there was no such officer in the province. He laid stress on previous experience and cited the case of an Architect in Central India who had no knowledge of local conditions, with the result that the houses designed by him were altogether unsuitable for that Agency. He added that he had not worked out figures in connection with the cost of his scheme.

886. (*Mr. Mackenzie*). The travelling auditor would be required to audit the accounts of a month or more of each division on a specified date, but not necessarily to take up all the accounts of the division on that date. It was possible, however, that this specified date might not suit the Executive Engineer and it would be decidedly objectionable if he had to come to his office at the beginning of every month.

887. The leniency to which he had referred in regard to dismissals of officers applied also to supersessions and postponements of increments. He remarked that it was rather difficult to say whether, if a man's increment was postponed, he should thereby become junior to a

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man of the same standing whose increment had not been postponed, but he was of opinion that the fact that a man's increment had previously been postponed should be taken into consideration in making selections for the rank of Superintending Engineer.

888. An extra pension was given to officers who had served as Superintending Engineers for three years, but this did not, he thought, apply to men who had recently joined the service. He could not say whether the administration was loath to pass over a man for the post of Superintending Engineer as it debarred him from obtaining this extra pension, but he was of opinion that there was a tendency not to utilize selection sufficiently.

889. The Public Works Department was ancillary to other departments, in that every other department was dependent on it in some way or other and hardly any other department could get on without its assistance; the result was that the Public Works Department was 'maid of all work' to the other departments in the province and hence had to satisfy a number of masters. It would not be possible to add the Deputy Commissioner to these by making that officer responsible to the other departments for the efficiency of the Executive Engineer's work. He did not see any advantage in making the Executive Engineer an assistant to the Deputy Commissioner. In the case of forest and medical officers, it was only where their work trenched on particular tracts over which the Deputy Commissioner or Commissioner exercised control that they were subject to the control of these officers. It would be difficult to put the Public Works Department officer in the same position because, outside his technical duties, there was not much left in regard to which he could be made subject to the control of the Deputy Commissioner or Commissioner.

890. It would be of great benefit if more practical training were given to all officers in the Public Works Department. He considered that these officers should be put on probation in the Department on joining and, if they showed progress, given opportunities of taking a further course which would include practical training. Their salary need not necessarily be less than they would get on confirmation, but they would not be confirmed unless reported on as suitable. In order to give Indian B.Es. this practical training he considered that the best method would be to place them in definite charge of a portion of a work, but admitted that there would be difficulty in doing this for an unlimited number of people. If, however, it could be done, he thought that these B.Es. would be entitled to a small salary and he would allow this even in cases where they were not in charge of a definite work.

891. He had not much experience of the training given in the engineering colleges in India, but considered that it was always an advantage to have as much practical training as possible running concurrently with the theoretical course. He had, for example, never met an engineer recruited from an Indian college who was able to drive an engine and it would be a great advantage if such instruction were given at those institutions.

892. He was of opinion that the tendency in the Central Provinces was to make sub-overseers responsible for plans which ought to be prepared by the upper subordinate or gazetted staff. With reference to the proposal that *mistris* should be given a little general education so that they could replace sub-overseers, he remarked that a good sub-overseer was very hard to beat and that such a man imbibed practical as well as theoretical experience, although as a rule sub-overseers were weak in detailed knowledge, not possessing the detailed knowledge of a *mistri*. The majority of sub-overseers recruited in the Central Provinces were from Roorkee. Formerly, there had been a college in Jubbulpore from which such men were recruited for the province.

893. Unless a temporary man had a college qualification or had passed the local examination held by the Superintending Engineer, he was not made permanent. Temporary men were engaged, however, for temporary purposes such as surveying, even if they had not had a college training.

894. (*Rai Bahadur Ganga Ram.*) As a rule, in calling for tenders, a notice was put up at the Executive Engineer's office. In the case of a big work a circular was sent round to every contractor on the Executive Engineer's list. The Executive Engineer always kept a list of approved contractors.

895. Any local body who asked for a schedule of the Public Works Department rates in the Central Provinces received a copy. It was not necessary to interchange rates with local bodies as in practice these bodies merely adopted the Public Works Department rates.

896. At stage I of the plans, the estimates were based on plinth area, and there was a printed statement showing the cost per square foot of plinth area of works already constructed. Last year, however, information had been collected showing cost per unit of the cubic contents.

897. He explained that the powers which he possessed of according technical sanction to works designed on standard plans up to a limit of Rs. 50,000 were necessary since the cost of buildings such as police lines, etc., might accumulate to that amount. The maximum cost of any single building constructed on a standard plan of which he had had experience was that of a circuit house costing Rs. 25,000. High schools were also constructed on standard plans.

898. Personally he was in favour of a provident fund in place of pension. He approved of the suggestion that government should be given power to get rid of a man with whom they were dissatisfied on six months' notice and that an employee should also be given the option of leaving at any period of his service taking with him what he had accumulated in his provident fund.

899. Accounts for major works (works costing over Rs. 5,000) were kept by sub-heads, but all sub-heads costing less than Rs. 500 were lumped together into one.

900. It was only by applying to firms that it could be ascertained, before indenting on the India Office, whether any particular article of indigenous manufacture was obtainable in India. Beyond such application there was really no guide as to whether articles were obtainable in India or not.

901. He approved of the suggestion that the Director-General of Stores should have his head office in India instead of in England, and considered that this would expedite matters, and would still enable such articles to be obtained from England as could be got cheaper there. Though it might cost more to have the Director-General of Stores in India, he thought it would be more economical in the end. He had sometimes found that firms supplied materials to the India Office in England at a cheaper rate than they would supply them to an individual in India direct, and it would hence be advantageous if the India Office representative were located at Bombay.

902. When a municipality asked the Public Works Department for advice as to the preparation of plans, no charge was levied by the Department. When, however, works were executed by the Public Works Department for a municipality or local board a charge of 10 per cent. was made for establishment and 1½ per cent. for tools and plant thus making 11½ per cent. in all. Advice was given free although it entailed extra establishment.

903. The circle engineer whom he had suggested in his scheme would be equivalent to the present Superintending Engineer.

904. As a Superintending Engineer, he had been privately consulted by the Commissioner in connection with the appointment of the divisional local fund engineer, but there was no rule specifying that he should invariably be so consulted. The divisional local fund engineers were appointed by the Commissioner, and were in charge of more than one district. He did not think such an officer could be transferred from one circle to another, but imagined that local arrangements between two Commissioners could be made for such transfers if necessary. The divisional local fund engineer was in no way responsible to the Chief Engineer.

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905. (*Mr. Cobb.*) An attempt had been made in the Central Provinces to give local bodies some of the work at present executed by the Public Works Department, with a corresponding grant for establishment in addition to the work they had always done. The only control exercised by government consisted, in the witnesses' circle, of inspections by the Superintending Engineer who drove over the roads and made inspection notes. This control, he admitted, was nominal and he had found from his experience that work of this nature executed by the local bodies was not well done. He considered, however, that the experiment had not been given a fair trial as the work was centralized in the hands of one man who had to look after scattered works in five districts with the help of an insufficient and inferior establishment. To render such an experiment a success the engineer establishment would have to be increased and both the quantity and quality of their staff improved. He had never considered how the necessary government control could be established over local board engineers and over the expenditure of government grants; he had merely arrived at the opinion that the local boards rather than the Public Works Department should construct the works in question because, when he first came to the Central Provinces, he had found that these two agencies overlapped each other, and that the Public Works Department was recruiting men too highly trained for the class of work that had to be performed.

906. Roads were always consolidated during the rainy season and the actual cost of this consolidation depended to a large extent on seasonal conditions. If there was a plentiful rainfall water was available close by and the cost was not so much as in a year in which the rainfall was scanty. The metal collected was measured before and at the end of the consolidation season, and it was assumed that it had all been put on to the road and had not been used elsewhere. Consolidation was carried out under the supervision of the sub-divisional officer and his subordinate staff.

907. By his remark that it was difficult to get rid of an inefficient permanent servant he did not mean to convey the idea that there was extreme laxity of discipline in the Public Works Department, but that there was room for improvement. It was a very rare occurrence indeed for a permanent servant of the Public Works Department to be dismissed from the service on the ground of inefficiency.

908. He considered that the fact that the Chief Engineer was also Secretary to the Public Works Department of the local Administration was beneficial to the service.

909. (*Mr. Durie.*) The efficiency of the Public Works Department compared well with that of other branches of the administration. He was not aware that the Public Works Department was worse off than other departments in connection with such matters as that of getting rid of inefficient employees, but he had no detailed knowledge of other services.

910. He was of opinion that transfers between the Buildings and Roads and Irrigation Branches should not be made at all, but, if necessary, they should take place at the commencement of a man's service. It would be a retrograde step for a man who had specialized in irrigation to spend part of his time on buildings and roads, and he thought that such a man ought to stay in his own particular branch. An officer should specialize at the commencement of his career so that he would be more efficient when he attained the rank of Superintending Engineer, and hence his opinion that the two branches of the Public Works Department should be kept quite separate.

911. In connection with the small Imperial service of specialists which he had previously suggested, who would spend their time in inspecting and preparing designs, he thought it would be necessary for these officers to go through a period of service in a district. This term of service might be fixed at one or two years, which would suffice to acquaint them with the methods of work even if they did not undertake actual execution. This would facilitate recruitment at a later age of men

who had had practical experience in England and would give them a more thorough knowledge of the various methods of designing.

912. It was of some advantage for a Superintending Engineer to have had eight years' experience as an Assistant Engineer and ten years' as an Executive Engineer. He added that a man would find out his own mistakes after he had inspected two or three works which he had himself designed.

913. He would be very diffident in recommending that such contractors as existed in the Central Provinces should be entrusted with the execution of any large works without close supervision.

914. Percentage charges of establishment were not a reliable measure of the efficiency or economy of the work of the Public Works Department, and the spending of an extra percentage on supervision, might be beneficial. These percentage charges were very misleading, partly because the present establishment could not be reduced below a certain amount, so that when the budget grant was low there was a high percentage of establishment, and also because a number of scattered works required just as much establishment as one or two big works although they might not entail half the amount of expenditure.

915. The inducements for contractors to take up works were not very great at present and the risks these contractors ran were very grave. A contractor was liable to serious loss through making advances to *coolis* or for materials. One of the reasons why contractors could not be secured more readily was that they had to 'square' subordinates. This 'squaring' of subordinates was ingrained in the East, and one or two gentlemen had told him that they had originally wanted to become contractors, but were deterred from doing so owing to this propensity in the lower subordinate class.

916. There was a large programme of road construction in the Central Provinces reserved for famine works. The construction of a new road in ordinary circumstances was quite exceptional as the budget provision for this class of work was so small. If a contractor were induced to take up about ten miles of maintenance of road it would be apt to lead to trouble by affording facilities to encroachment on the road boundaries. There would also be difficulties in maintenance as the contractor himself would not be interested in encroachments and the government supervision over the road would be very much less. At present one officer maintained fifty miles of road and if any encroachments on that road were reported he would get into serious trouble. A large contractor would only take up the maintenance of a road if he were given considerably more than ten miles, and that for a period equal to at least twice the life of metal used on the road. Such a contractor would not find it economical to allow bad repairs, thus causing the road to deteriorate, but he admitted there would be a tendency on the part of a contractor to put down a thin instead of a thick renewal coat at the end of the period of maintenance.

917. As a private person who was building a house was usually not pressed for time and as the specifications adopted were generally lower than those of the Public Works Department the rates of that Department should be compared not with those paid for private buildings but with those of such bodies as railways, port trusts, municipalities and the like.

918. As a rule the Public Works Department constructed work much more rapidly than a private person, but the Department was greatly handicapped by the present date of closing the financial year. For example, when sanctions were obtained in April, it was too late to make arrangements for brick-burning before the rains, and as construction could not be commenced till the bricks were ready the work could often not be commenced before December, and hence the charges of delay brought against the Department. If the financial year commenced on the 1st September there would not be so many complaints about the dilatoriness of the Public Works Department.

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919. In connection with the appointment of an expert Architect which he had previously suggested, it would, he thought, be possible to have a separate Architectural Branch in the Secretariat to deal with designs for the Central Provinces, and for the execution of the work to be entrusted to the Executive Engineer with occasional supervision by the Architect.

920. If the control of works were handed over to Commissioners, certain works would be pushed on at the expense of others according to the predilections of the officer concerned, and as a Commissioner's term of office was limited to only a few years his successor might reverse what had been done in the past. It was a great advantage to have some continuity of procedure and this could be effected by the introduction of a programme of communications and new construction, for the whole province, framed by the head of the department, with the approval of the head of the province, who would see that the development of the province was carried out on regular lines. It was inadvisable to hand over such programme of communications to district boards.

921. Bridge experts with railway companies in England were really consulting engineers. Such officers would be capable of carrying out the superstructure of a bridge in India but would not be able to advise on the foundations which varied tremendously. The average engineer in India had experience of only three or four bridges in the course of his service, whereas a bridge expert who constructed only bridges would be able to gain experience quicker than a man who constructed bridges in a single district at infrequent intervals.

922. He considered that the new promotion rules were not satisfactory as no record of a man's service was maintained which could be used as a guide to selection when the question of his promotion came up. It would be an advantage if a record were kept showing what work each man had actually done, i.e., what buildings he had constructed and what roads he had aligned, etc., and the Chief Engineer, with this record before him, would be in a better position to judge of each man's capabilities.

923. If extra powers were delegated to sub-divisional officers, which involved the grant of funds to them, their office establishment would have to be increased, as they had not at present any clerical staff capable of checking the expenditure of such funds. It might relieve the Executive Engineer, but it would tend to increase the sub-divisional office staff. Sub-divisional officers made payments but were not able to pay final bills beyond the limit of Rs. 200 without check in the divisional engineer's office.

924. He had not come across any subordinates who could tell him, if a pump was out of order, what was wrong with it, or who could put matters right. These subordinates had as a rule no detailed knowledge of mechanical engineering but left everything to the *mistri* and even he had usually only a very hazy idea of the principles on which a pump was worked. Sub-overseers ought to have the handling of all plant on their works, and hence he thought that it would be a good thing if they learnt to drive a steam roller, for example, and generally to drive and repair simple machinery, although he admitted that it was impossible to obtain at a low salary a man efficient in all trades. He was of opinion that it was a mistaken policy to have cut down the workshop training given at the Nagpur Engineering School from about fifteen hours a week to two.

925. The records kept by the Executive Engineer which were useful to him were his register of works, his cash book and his register of receipt and issues of stock. He could, if necessary, be relieved even of his contractors' ledger. A lot of the work which was done in the Executive Engineer's office was of no assistance to him in checking his work, and he agreed that the compilation of accounts might well be made over to a central office. This would not, however, result in any ultimate reduction in establishment, but would merely mean the transfer of the Executive Engineer's accounts staff to the Comptroller's office.

926. He agreed that most of the objectionable items noted on in the Comptroller's office could be disposed of finally by the Superintending Engineer, without being sent to the Executive Engineer for explanation, but the latter officer would still have a considerable number to explain away as the Superintending Engineer had not sufficient local knowledge for the purpose. He was not, therefore, in favour of a Superintending Engineer being made the audit officer in regard to the Executive Engineer's accounts.

927. (President.) He did not see any reason why a Superintending Engineer should have powers for communications up to only Rs. 10,000, whereas for buildings he had powers up to Rs. 25,000, and considered that such an officer should be given if anything more power for roads than for buildings.

928. With reference to his scheme for a district board staff two points were put to him, firstly, how government control would be exercised over government funds and, secondly, whether the staff which he had suggested should be employed under that scheme would be more numerous and would involve more expenditure than the existing Public Works Department establishment. He was asked to elaborate this scheme in a note and to submit it to the Committee later and this he promised* to do.

* Mr. Thomson afterwards submitted the following note:—

A proposal for the re-organization of the Roads and Buildings Branch of the Public Works Department in the Central Provinces and Berar.

This proposal is based on the desirability of removing the following defects now extant:—

(a). *Dual agencies for the execution of work in the districts.*—It is not economical to have the Public Works Department staff and the district fund staff working side by side in the same area, traversing each other's roads in the course of their inspections, and competing against one another for the supply of materials and for the same contractors.

(b). *Dualism in the Public Works Department itself.*—The imperial and provincial branches of the Public Works Department are recruited from officers with a different standard of qualifications, are remunerated at different rates of salary, are promoted under different rules, but are employed side by side on identical work.

† (c). *Radical defects in the present system of carrying out district fund works in the Central Provinces.*—The divisional local fund engineer is placed in executive control of petty works and maintenance in the whole area of a division, comprising, as a rule, five districts, the works frequently being entrusted to him for the sole reason that they are situated in inaccessible places. He has to work with a staff that is largely recruited by men weeded out of the Public Works Department, or men who prefer a service because there is less efficient control.

It is impossible for him to carry out his duties efficiently. The district councils, on the other hand, complain that they are called upon to finance and sign completion reports for works carried out by a staff not under their control, but under the control of an officer who is only able to do so in a most superficial manner.

(d). *The wasteful employment of highly trained engineers.*—The highly trained engineers recruited at home are employed for the first 20 or 25 years of their service on works of a very varied nature, the majority of which could be carried out as efficiently by officers with lower technical qualifications, and in some cases more efficiently, as the officer with the higher training and more ambitious aspirations is unable to throw the same interest and concentration into the unending drudgery of measuring up, making petty payments, and *coolli* driving.

On the other hand, there is the residuum of important work which not only calls for the services of a highly trained officer, but can be best entrusted to one who has specialized in one branch, and has not dissipated his energies on several branches.

ENGINEERING STAFF.

The proposal in outline is.—A Chief Engineer for the province with an architectural assistant, a Sanitary Engineer and road expert on his staff, with a divisional engineer for each division who will be government servants; while

† This is the case in the Central Provinces and not Berar.

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the district staff will be servants of the district councils, and will consist of a district engineer, with an assistant district engineer for each important *tahsil*, and an upper subordinate for each of the less important *tahsils*.

EXECUTION OF WORK.

The district engineer to be the executive officer, and will, as a rule, carry out the whole of the maintenance and original works in his district, whether financed from local, provincial or imperial funds, and the whole of the district staff will be under his orders.

He should be relieved of the annual repairs of unimportant or scattered buildings as they can well be entrusted to the local representative of the department concerned, while in the case of any large provincial project, such as a difficult length of new road, or a big bridge, the Commissioner and Chief Engineer will decide whether it shall be entrusted to the district staff, or to a special staff placed under the divisional engineer advised by the road expert. Small municipalities should be encouraged to entertain a subordinate; larger municipalities, an Assistant Engineer; and the few big municipalities, an Executive Engineer.

As regards sanitary works, the Sanitary Engineer will be the consulting and inspecting engineer; small projects may be prepared and executed by the district staff; but private agency should be encouraged to come forward for the large works.

POWERS OF SANCTION.

Since the Chief Engineer will have five divisional engineers under his control, the local Administration should be allowed to delegate to the divisional engineers larger powers than are now given to Superintending Engineers: e.g., technical sanction to original works not on standard plans Rs. 50,000.

Original works on standard plan, unlimited.
Maintenance, unlimited.

The district engineers' powers should be regulated by the Chief Engineer under the advice of the Commissioner and divisional engineer, subject to a limit of technical sanction to—

Original works not on standard plan Rs. 10,000.
Original works on standard plan, unlimited.
Maintenance, unlimited.

CONTROL.

The divisional engineer will inspect the district and sub-district offices, all works financed from imperial or provincial funds, and such local fund works as the district councils desire; while the accounts will be audited by the Comptroller's staff.

The divisional engineer will give orders direct on technical matters on works financed by provincial or imperial funds; but in all other matters he will either address the district council or the district engineer through the council.

In rare cases it might be necessary to take the extreme step of employing a special staff to carry out government works in a district.

B. C. DUBE, Esq., Executive Engineer and Under Secretary to the Hon'ble the Chief Commissioner of the Central Provinces, Public Works Department.

Written Statement.

929. (I.) **Economy and suitability of methods of execution of public works.**—Civil works are executed in the Central Provinces, by the Public Works Department, by the following methods:—

- (1). A time-limit contract.
- (2). A piece-work contract.
- (3). The direct payment of labourers engaged and materials used, known as the departmental method. The first two methods are generally adopted and infrequently, due chiefly to lack of capable contractors, the departmental method is resorted to. The first two methods are fairly economical. There is no doubt that given the right man in charge of departmentally executed works, government obtains the best value. When the man in charge is either incompetent or dishonest, the work becomes expensive. What is required is the right man in charge.

930. (II.) **Encouragement of other agency.**—Such private enterprise as exists is fairly sufficiently encouraged, and the Public Works Department system prevents the formation of rings of contractors. Open competition in bidding for works is adopted and the methods

CONDITIONS OF SERVICE AND RECRUITMENT OF THE STAFF.

The Chief Engineer.—As greater powers are to be delegated to the divisional engineers, and as the Chief Engineer will have experts in three main branches as his assistants, the Chief Engineer, Irrigation, should be able to fill this post in addition to his own duties.

The Architectural Assistant to be either a Public Works Department engineer, who has qualified as an Architect, or recruited in the open market, but it is most desirable that he should have local experience.

The Sanitary Engineer, with one or more assistants, to be a special branch, which may be entered by Irrigation Public Works Department officers, with not more than 12 years' service, or specially recruited in the open market.

The Road Expert will be selected from the special staff, already mentioned under the paragraph dealing with the execution of works; he will be engaged on the preparation of projects and inspection of construction of difficult lengths of roads and large bridges.

The Divisional Engineer.—Vacancies to be widely advertised and applicants selected by a board, consisting of the Chief Engineer, the Commissioner concerned, and, if possible, the divisional engineer vacating the appointment. Preference to be given to district engineers already serving in the provinces.

District Engineers.—Vacancies to be widely advertised and applicants selected by a board consisting of the Commissioner, the divisional engineer, and two representatives of the district board.

Assistant District Engineer.—Vacancies to be widely advertised, and applicants selected by the Deputy Commissioner, divisional engineer, district engineer and two representatives of the district board.

Salary to be for the post held, and promotion from less important posts to more important posts by selection only.

In lieu of pension, a provident fund to which the employing agency will also contribute. Services to be terminable by a short notice by either party.

Financing establishment charges.—Since the staff will draw a fixed salary, but will be called on to estimate and supervise, and sometimes construct departmentally, projects which are financed by other than the employing agency there must be a fixed scale of fees for the services rendered, to be adjusted periodically by book transfer.

It must be borne in mind that a higher scale must be paid for small or isolated works, that much greater supervision is required in this country than at home; and that no percentage on the expenditure can be said to be too high as long as it effects an ultimate saving, either in the estimate or execution of the work.

In the same way, it is sound to insist that local bodies should pay fees to government for services rendered, even if those services are limited to technical sanction, as they are thereby encouraged to engage a better class engineer who can be entrusted with larger powers.

are healthy. The works executed in the Central Provinces are in scattered places, sometimes not easily accessible by roads, and contractors will not take up works at places where the scheduled rates signify loss to them. Private enterprise is generally financed by speculating *Marwarees*. The average contractor pays about 12 per cent. interest for his capital. These interest charges have to come out of profits, which are small. The building trade in these provinces is not yet an attractive proposition, and private enterprise is confined to uneducated men, without much capital or scientific training. All the same, good work at economical cost is done as a rule. It may sometimes be expensive, but it is good value. If you build a house in stone for a man, whose ordinary needs do not go beyond a house in mud, the former is expensive. The indigenous inhabitant has elementary taste, and the Public Works Department builds largely for simple needs in a somewhat, but not excessively, substantial manner. The Public Works Department is quite capable, if asked to do so, of putting up flimsy, cheap and perishable structures. Those who want such class of works done for them should say so, and the Public Works Department rules should be so changed that a modification of speci-

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fications of any work may be permissible, without much red tape. The standard of specifications prevailing in the Public Works Department is high. There is often a good deal to be said for cheaper specifications, but the Public Works Department practice is to use rather superior materials and better workmanship than the public has a taste for. The Public Works Department, however, builds for a certain amount of permanence as a rule, and rarely for true expression, and does so economically. The only remedy is to educate the public, so that their culture improves. If, however, it is considered necessary to entrust the construction and upkeep of certain classes of public works to agency other than the existing Public Works Department and no objection exists to incurring more expenditure, which such a course will, in my opinion, render certain, it should be stipulated that, as the Central Provinces is a poor province, any extra cost of such experiments is to be borne by the Imperial Government.

(2). The profits expected by large firms will be 15 per cent., and probably not less than 25 per cent. on the real value of work done by them. The exact percentage of increase in the cost of work that this course would involve depends on the following :—

(i). Assuming that the large contractor's organization is well run, the profits aimed at will depend on the firm's desire to expand its business and the standard of supervision by government inspectors; also to the extent to which revision of estimates, plans and rates due to clever changes in foundations and specification will be passed by the inspectors. A clever firm would be constantly suggesting changes in all plans and estimates to increase the original contract amount, and the higher its standing the less amenable will it be to control, even from government inspectors much less from lay departments. I make this forecast with deliberation and confidence, and consider that the cost of work, when finally paid for, will be greatly in excess of the contracted amount, perhaps in every case.

(ii). Assuming that the contractor is asked to invest more than 10 per cent. on the value of the work which he does in one year, he will expect a 25 per cent. profit to cover—

- (a) manager's wages;
- (b) engineers' and work staff wages;
- (c) office staff and law charges;
- (d) interest and depreciation of tools and plant;
- (e) travelling allowances;
- (f) 12 per cent. on the capital invested.

To these profits must be added the cost of the supervising staff maintained by government, which will cost about 10 per cent. more. So that one may expect an addition of 35 per cent. to the present costs. I reckon that the Government of India is prepared to pay the bill for these charges, if made.

(3). We have some experience in these provinces of the piece-work system combined with departmental work. The secretariat building, the post office, the council hall at Nagpur are examples of this method. They are economically built and cannot be said to be expensive. No local or imported contracting firms could have executed the works as a whole at a smaller cost.

(4). The question of trained men available for work is important. No sub-divisional officer can be a good one, unless he has done work of a *mistri*, a time-keeper, a sub-overseer, a sub-divisional clerk, a paymaster, what in India we call a "*Har-jun-maulah*," or a sort of "jack-of-all-trades." There are no established trades for the supply of building materials in the majority of places where buildings have to be put up in India, as is the case in England. This class of training is necessary for any technical profession a man may specialize in. The Public Works Department produces general practitioners in the building trade.

(5). To do this work, a good Executive Engineer has to be not only highly competent technically, but to be uncommonly shrewd as a businessman. The class of men whom we are likely to appoint directly either from

England or India have to be trained before they can be of any use in controlling rates.

(6). The rates in the Central Provinces are carefully analyzed, and I can say that they are unfavourable to promiscuous profiteering if the supervision is good. I can also say that the substitution of inspectors and contractors for the Public Works Departmental agency would increase the cost of works substantially; *without the outturn being, necessarily, better value.*

(7). With regard to the question of handing over unimportant buildings and roads to local boards, the experience in these provinces is that owing to lack of funds the local boards cannot afford to employ a trained engineer for a reasonably small and compact territorial charge. The result has been that supervision is inadequate and the roads have deteriorated and the repairs to buildings are not carried out in time. On general principles, the existence of two agencies side by side does not effect economy, nor can the experience gained by one set be utilized by the other.

(8). The burden of executing local works in the interior of the Central Provinces falls on the subordinate revenue officials, who act as stiffeners to local self-government, and these officials are frequently transferred.

(9). Government cannot shed off the responsibility of lending its officers to arrange for the execution of unimportant civil works for the simple reason that the majority of district councillors are too apathetic. Also, it has to be noted that the construction agency of district boards cost them 15 per cent. on an outlay of Rs. 15,48,046 for the year 1915-16. The government pays the district boards 11½ per cent. on the estimated cost of transferred works. This is not sound business for the district boards. The corresponding cost of construction establishment for provincial civil works was 14 per cent. on an outlay of Rs. 51,16,411, *vide* page 47 of the Finance Schedule for the year 1915-16.

931. (III.) **Changes in organization.**—The present systems of recruiting the engineer service are not satisfactory, chiefly, because the financial inducements are not sufficiently attractive for the best talent in either India or England. Recruitment from England should be confined to practising specialists, while the rest of the work can be easily carried out by engineers trained in Indian colleges.

(2). The needs of this province require that there should be a qualified Executive Engineer in each district, and this points to a larger cadre.

(3). This province has the following civil divisions and districts :—

Nagpur Division	}	1. Nagpur. (a)
		2. Wardha. (b)
		3. Chanda. (b)
		4. Bhandara. (b)
		5. Balaghat. (b)
Jubbulpore Division	}	6. Jubbulpore (a)
		7. Saugor. (c)
		8. Damoh. (c)
		9. Seoni. (c)
		10. Mandla. (c)
Chhattisgarh Division	}	11. Raipur. (a)
		12. Bilaspur. (b)
		13. Drug. (c)
Nerbudda Division	}	14. Hoshangabad. (b)
		15. Nimar. (b)
		16. Narsinghpur. (c)
		17. Chhindwara. (a)
		18. Betul. (b)
Berar Division	}	19. Amraoti. (a)
		20. Akola. (a)
		21. Buldana. (b)
		22. Yeotmal. (b)

The first-class districts which should be in charge of the best Executive Engineers are marked (a) and are six in number. The second-class districts which should be in charge of the next best men are marked (b) and are ten in number, and the third-class, which should be in charge of upper subordinates or junior assistants are marked (c) and are six in number. I would propose

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that each civil district should have an Executive Engineer, and there should be *three circles of superintendence*. The present charges of Executive Engineer and Superintending Engineer are too large in territory for adequate supervision, and every Executive Engineer should carry out *all government civil works, district council or local fund works, except municipal original works below Rs. 5,000*. The local bodies should continue to pay the usual percentage charges. There should also be a Sanitary Engineer, and some special sanitary works divisions and sub-divisions wherever enough work justifies the creation of new temporary divisions. The pay of the establishment of all classes should be refixed on an increased scale, and I guarantee economy and efficiency. I do not wish to fix the cadre strength at this stage, but would press for the acceptance of the principle.

(4). The provincial engineer rises to Rs. 850 *per mensem* after 19 years' service. This is a meagre prospect. He has to meet the following monthly expenses:—

Government provident fund	Rs.
Minimum life assurance premiums	101
Education of three or four children	35
House rent	300
Servants	85
	100
TOTAL	621

Thus (Rs. 810—Rs. 621)=Rs. 189 are left for living expenses, which is very inadequate.

(5). The salary of the Indian college engineer should be raised and, considering that his work is of a responsible nature, the best men, if such are to be encouraged, should have the same prospects as men in the executive and judicial services, who are no better. For instance, two Indians can rise to be Deputy Commissioners and four Indians can rise to be District and Sessions Judges. An Indian in government service can rarely expect to rise higher than an Executive Engineer, and the maximum pay to which he may rise by professional merit should be Rs. 1,500 *per mensem* from a minimum of Rs. 800 *per mensem*. There should be three grades of Executive Engineers.

(6). It is not necessary to promote *every* man from the assistant to the executive class, as is done at present. The time-scale system of promotion is not fair to the man who is given heavy charges.

(7). There should be no promotion from the non-gazetted to the gazetted ranks. This lowers the prestige of the service and, as the Executive Engineer has to live and move amongst the district officers, the solidarity of the district unit of government is adversely affected by the presence of men, who are *personae non gratae*. The pay of Assistant Engineers should be fixed at Rs. 300 *per mensem* rising to Rs. 700. This will adequately provide for such men as are not likely to be good Executive Engineers. The terms "Provincial" and "Imperial" should be abolished.

(8). The criterion is the class of work to be done. Both have to do the same work, and the best provincial man is frequently better than the average imperial man. The reorganization should take this fact into consideration. The recruit from London may be given an extra allowance of 10 per cent. *per mensem*. This will meet the cost of voyages. As a matter of fact, the Indian colleges can provide sufficiently good men to man the entire Department. It is only a question of time, when perhaps no necessity may exist to obtain recruits from the overseas to help us in executing our civil works.

932. (IV.) Relations with other departments and sub-branches.—The relations of the Public Works Department with other departments are satisfactory.

(2). Improvement is urgently necessary in the class from which the subordinates are drawn. The line on which improvement should be effected is to increase the salaries. A sub-overseer should commence service on Rs. 50, rising up to Rs. 150 *per mensem* in 20 years. An upper subordinate should commence on Rs. 150, rising up to Rs. 500 in 25 years. There should be no other class of subordinate in permanent state employ.

933. (V.) Decentralization and (VI.) Simplification of procedure.—With regard to decentralization within the Public Works Department, I would say that it is very desirable. This applies to:—

- (i) accounts procedure;
- (ii) administrative procedure;
- (iii) executive procedure.

(2). With regard to accounts procedure, I may say that a strong committee consisting of an equal number of experienced public works officers and accounts officers should be appointed to consider the replacement of the present system of account by a simpler system.

(3). With regard to administrative procedure for sanctioning estimates, the powers of Executive Engineers to sanction estimates for original works may be increased. The existing powers are given in the Central Provinces Manual of Orders, Volume III, 92, 93, 94, 95, 96 and 97.

(4). In my opinion Superintending Engineers should be generally delegated the powers of the local Administration, and the Executive Engineers should exercise most of the present powers of the Superintending Engineers. The Chief Engineer's powers will then remain purely advisory for large projects, and he will serve as the administrative link between the Chief Commissioner and the Public Works Department dealing with the budget, superior establishment and other matters of imperial policy.

(5). I would suggest that the Code should be so altered that the unspent grant for a work should not lapse. An account form should be added to show a ledger account of each work. This has been done by the local Administration in case of grants for transferred works executed by the local fund agency.

(6). This will mean fluctuating budgets, which may embarrass the Government of India, but it may be possible to finance civil works from loans, instead of from current revenue. This brings the subject in touch with the operations of the Finance Department of the Government of India, but does not appear to be impossible of solution. If the official year was abolished for civil works great advantages are certain to be secured.

934. (VII.) Education.—The system of education in the Thomason College, Roorkee, of which I am an *alumnus* is organized on a sufficiently broad basis to meet the needs of private agency as well as of government. I may say that outside local fund works, the private demand in these provinces is *nil*. The Roorkee College has ceased in recent years to attract suitable candidates, because of the miserable prospects as submitted above of the provincial engineer service. The men who obtain the guaranteed appointments used to be, specially the top few, of the stamp who could have passed the Indian Civil Service examination had it been held simultaneously in India and England, but this cannot be said of many who are coming out of Roorkee now. They are lacking in general culture. Some turn out well; others do not. But this is true of Europeans as well when they join the service. The capacity to express oneself with felicity and to persuade financing bodies to invest their funds is an art which needs further development, but this is true of the engineering profession all over the world. I have no doubt that, if government wished it, the best Roorkee engineers could at a pinch be of military value too. I have no experience of the working of other colleges in India. The difference between a Roorkee product and other college products in India is that the Roorkee man comes out better grounded in essentials of practical work and is early made to feel and behave like a gentleman and an officer from the day he enters the engineer class. The traditions of the college require the student to play up, and the discipline under the Royal Engineer officers is of the best. The only directions in which I would suggest an improvement is that the Indian engineering colleges should be more in touch with current engineering practice and should act as research institutes, and help more in deciding formulae and co-efficients for various problems. The study of economics should be insisted on in all

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colleges, and steps taken to instil "money-sense" into students, which maketh a man make one rupee go as far as two. I do not think an engineering college is wanted for the Central Provinces. There is one scholarship of Rs. 40 per mensem tenable for Central Provinces students in the engineer class. This should be raised to perhaps ten of Rs. 60 per mensem, as the cost of living has increased. The average expenses of a student would now be about Rs. 125 per mensem. During 1900-03 I used to spend about Rs. 100 per mensem. The Nagpur Engineering School will meet all local demands for future lower subordinates. There should be only two classes of subordinates, as has already been described. There is no necessity for classifying them upper subordinates, supervisors, sub-engineers, etc. All designs and estimates must be framed by Executive Engineers, who should have an adequate and trained staff of draughtsman and computers. There are no large contracting firms established in this province of substance standing and experience. There is no necessity to create them. If there are 22 divisions, a large proportion can be run by Indian-trained men, say, 16, and the rest by Europeans.

935. (VIII.) **Practical training.**—Regarding training, there are two things: Firstly, if you train a qualified man who is apt, keen, active and reasonably free from original sin, you can train him for a sub-divisional officer's work in one year. This is the period prescribed for qualified students from Roorkee to make them fit for an Assistant Engineer's post. The Public Works Department Code does not specifically provide a period of training for others who are appointed directly as permanent Assistant Engineers. In my opinion, they should be trained for one year. Three years is the period when an Assistant Engineer can be said to be reasonably familiar with Indian conditions. Ten years' service makes him fit for an Executive Engineer and useful as an adviser on local projects, from the administrative and financial point of view. There are, of course, exceptions in both directions. Secondly, a good deal depends on the Executive Engineer who trains the fresh material. If the Executive Engineer himself is an incompetent man and has not got the capacity to inspire a generous enthusiasm for the profession in the disciple, the result is that the training is prolonged and is sometimes negative. The engineering profession involves the rounding off of many eccentricities, and there is nothing more wholesome than a good "Guru" or trainer. I think the training should continue throughout one's service, and a periodic course and test in modern practice should be prescribed for each engineer, at intervals of eight years, corresponding to the Chatham course.

(2). A man should not be trained for more than one year in India to see if he is fit for service in all respects. Once government decides to take a man on its permanent service, the training is thus for so long as the man is in service.

936. (General.) I now proceed to make some observations on the alternative proposals for the execution of civil works, and to discuss the arguments which impart to these alternatives a plausible air.

(2). The increase in decentralization made in recent years does not go far enough, and the essentially departmental character of the Public Works system will remain so, under any reorganization whatsoever. The regulations now embodied in the Public Works Department Code have a meticulous nature, because they are founded upon distrust of human nature and, although the Code can be simplified, it cannot be altogether done away with, as it will arise in some shape or other, regulations being the essence of the art of administration. Technical departments are naturally conservative, and poor countries cannot as a rule afford costly methods. The craze for modernity will receive its effective reply when there is no money to pay for it. As I have said before, there is no established private contracting agency in these provinces of recognised skill, standing and substance, except perhaps one firm. The better class of Indians will not take civil engineering as a profession, when they may have "to waste their sweetness

in the desert air." So long as the plums of the profession and the "izzat" carried with government service are not open to them, the better class of Indian will give a wide berth to a career in favour of others where his industry and brains will have a better market value. The provincial engineer service no longer attracts the best men, because it is not suitably paid. The failures of Indian colleges go to England, as a rule, to come out as so-called engineers, doctors and barristers. There are exceptions, of course. The struggle for existence is very keen now-a-days, and students in India have a very hard time. It is more likely that the talent which may be drawn to civil engineering as a profession will be diverted to scientific agriculture, the metallurgic trades, cotton spinning and weaving, medicine and perhaps educational work. So long as the masses of the people are not educated, there is no chance of the service of a civil engineer being generally applied for. Mass education is a primary condition of more refined ideas about how to live life. The modern products of the engineering colleges in India are more than good enough for 90 per cent. of our work for which we do not require specialists. What we want are good men thoroughly trained to do our ordinary hum-drum work of roads and buildings. Anything modern and elaborate can be paid for by obtaining advice from practising firms of engineers, as is done at present. The present Public Works system is conducive both to economy and gives the best results. The defects are that a man is given the work in an area which requires two men and is hide-bound by a lot of office work and tied to his table to an extent which no private employer would tolerate. The impatience with the so-called stereotyped and inelastic methods is another mode of resenting order and method in business, the wholesale abolition of which is sure to lead to disaster. The delay complained of by any department is due to the necessity of consulting many other departments, who are required to be consulted under the rules of procedure. Every large contractor and private civil engineering firm is free to tender for any work, and no hindrance is placed in their path in this province. They do not tender, even those from Bombay or Calcutta, because the rates obtaining in this province do not permit them to make adequate profits and perhaps they are shy of the Public Works system. If more comprehensive measures, e.g., the abolition of the Public Works Department, are contemplated, I can only say that the system is sure to arise in another and a more sinister form—with all or more of its faults, very little of its efficiency, a deal of waste and more delay than at present. The development of other departments has resulted in large increases of personnel, which have to be paid for, while the Public Works Department offers a convenient mass of clay, which is pared down, until its staff is now under-manned, under-paid, overworked, with Executive Engineers who have been automatically promoted, and has become fit for a commission of inquiry into its methods. The best indigenous talent will become available to government, if more posts on increased pensionable salaries are assured, and a healthy state of civic interest can only develop when people have become more civilized.

(3). A new system which contemplates the substitution of honorary administration directing a less highly trained agency cannot cost less by reason of loss of efficiency. The work of honorary magistrates is a case in point. Any reduction in the standard of supervising agency, upon the integrity of which depends the effective value for outlay incurred under conditions likely to prevail for the next fifty years in these provinces cannot be seriously advanced for adoption. The probability of an engineering firm undertaking to run their show with the aid entirely of decently paid Indians is *nil*. The firms will be out for profit, and it is more likely that a one-man concern will be evolved in each district if anything like a decent living is to be made by the better-class Indians. There is no room for more. Let each man be trained to his job in the next ten years, and one day, let the government proclaim that hereafter every district engineer ceases to be in government employ and

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will benevolently manage the work on his own. For financing, if necessary, co-operative societies could give an encouragement to each contractor a short-term loan on a low rate of interest to the extent of 10 per cent. of the value of work to be done in each district in a year. The necessary change could then be introduced by a stroke of the pen. Under these circumstances perhaps six inspectors with forty-four sub-inspectors could run the province. But this process will cost government a good deal. Unless there is some such system as the present Public Works Department, men would be unwilling to risk their destinies by working under district

councils or any *panchayati* system. What guarantee is there that respectable private engineering firms will receive fair treatment and payments in time from self-governing bodies without all sorts of trouble? As far as I can see, the time is not ripe, for this province at least, for creating large contracting firms with their own staff of expert engineers for the simple reason that this province cannot afford such firms for many more years, and owing to the situation caused by the war there is likely to be scarcity of funds for one generation at least.

MR. B. C. DUBE called and examined.

937. (*President.*) The witness stated that he was an Executive Engineer with thirteen years and four months' service all of which had been spent in the Buildings and Roads Branch in the Central Provinces.

938. He considered that the existing Public Works Department system of carrying on works was much more economical than any system entailing the employment of large contractors would be. His opinion was based on a comparison of the rates, as well as of the total cost of the buildings at Akola, as a result of which he found that the Public Works Department rates were much cheaper than the rates paid by private persons, provided the specifications were the same in both cases. Large contractors required a profit of fifteen to twenty-five per cent. on the value of all work done by them, while the margin of profit allowed to petty contractors was only five per cent. which, however, he thought was too low and should be raised to from 15 to 25 per cent. according to the status of the contractor. The larger contractor would demand a higher profit, as he would employ a skilled agency and better staff, and expect a fair return for his work. He instanced the case of a large contracting firm which was paid 17 per cent. on the value of the work done by them in Nagpur. He anticipated that if a system were introduced under which contractors were permitted to prepare their own plans and execute the work, subject to inspection by government inspectors, such contractors, exercising the dual functions of contractors and engineers, would be continually making changes in the plans after they had been sanctioned, especially in regard to foundations. Nobody could foresee what foundations would actually be necessary for a building until they were put down, and it would be possible for such contractors to make them say 3½ feet deep instead of 5 feet, a fact which would be very difficult to discover later. Under the present system, although contractors were employed, the engineers kept foundations very much in their own hands.

939. He was emphatically opposed to the making-over of any government works to district boards, or even of the latter's own works, with the exception of very petty ones. He did not think that district boards could control a staff, whether it was good or bad, and they were quite incapable of exercising powers over a technical department. Hence he did not consider that it would serve any useful purpose to associate district councils with the detailed organization for the execution of civil works. The control of district councils over works should be confined to a decision as to what was to be done, in other words to the accordance of administrative sanction, and it was useless, in his opinion, to confer upon them any powers in regard to the detailed execution of works. They should not be entrusted even with their own works unless they were of an unimportant nature and their aggregate value did not exceed a few thousand rupees. He objected strongly to the proposal that district councils should employ a competent engineering staff of their own to carry out both their own and government works in the district, as they would never have more than a nominal control. At present, all such work was done by heads of departments and Commissioners—and he was averse to district councils being given powers of control which they were not competent to discharge, nor did he think it desirable in the present circumstances of the country to

entrust them with such powers. In his opinion district boards were absolutely incompetent either to execute works or to manage their own engineering staff. There would be serious objections if the scheme were introduced. Bills would not be paid in time, and neither the staff nor the contractors would get fair treatment.

940. He suggested that there should be an Executive Engineer for each district. In his written evidence he had proposed twenty-two divisional charges, of which six were important, ten fairly important and six were small. Each of these should be in charge of an Executive Engineer of which class six senior and ten junior officers should be maintained, while the smaller divisions might be in charge of Assistant Engineers or upper subordinates. He proposed that there should be three Superintending Engineers for the Central Provinces. He considered that an increase of pay was essential, because the cost of living had increased and the responsibilities of the officers would be considerable, and his scheme was not at all expensive considering the money which government was spending on the reorganization of other departments. He admitted that the cost, compared with that at present incurred, might be considerable, but thought that it would be justified by the results anticipated from it. It was always a good investment to pay one's servants liberally. The result would be that everybody would be satisfied and supervision would be more effective. He did not consider that the present establishment charges were high compared with the work done. These charges came to 14 per cent. excluding the pay of the Superintending and Chief Engineers, and this in his opinion was a moderate figure.

941. He considered that the Executive Engineer's powers of technical sanction for original works should be raised from Rs. 2,500 to Rs. 5,000, but that the limit for minor works should be maintained at Rs. 5,000, and that there was no necessity for raising it to Rs. 10,000, as most of the works in a district were small and did not generally cost more than Rs. 5,000. Everything above Rs. 5,000 should, he thought, go to the higher officers of the Department for sanction.

942. The powers of sub-divisional officers were quite sufficient and should not be increased. At present they were empowered to make payments for final bills up to Rs. 200, and he would not trust them with higher powers as their status was not sufficiently good. They should not be given power to accord technical sanction to plans and estimates, even for small amounts, as the technical qualifications of sub-divisional officers were, on the whole, inferior.

943. He agreed that, from the point of view of the Public Works Department, it would be a good thing for the engineers to be relieved of the repairs to buildings, and for these to be entrusted to the different departments concerned, but considered that from an economical point of view it was not a sound proposal, as other departments would not be able to carry out their repairs as cheaply as the Public Works Department could.

944. The accounts system was rather complicated, and he thought that the better the Executive Engineer was the less time he devoted to the routine. The routine accounts work was fairly heavy, but he personally spent very little time on it and left it to the accountant. He never worried about the routine work. The Comptroller sent him a register of audit objections, and he had found

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that there was no harm done by paying only moderate attention personally to routine matters of accounts. He could not give any opinion on the suggestion that there should be a separate accountant in the divisional office, who would deal direct with the Comptroller and be responsible to the latter for all the accounts.

945. He was trained at the Roorkee College. The engineering students and upper subordinates were educated separately at that college. He considered that the upper subordinates of that college were good all round men both theoretically and practically and that they proved altogether satisfactory. He did not endorse the opinion that the theoretical training of the upper subordinates was too high for the class of work they were expected to do. He did not think they were wanting either in theoretical or practical training, and did not consider any improvement was called for in that respect.

946. He suggested that the Roorkee College should also perform the functions of a research institute. There was at present no research institute for the Central Provinces where, for example, different kinds of timber could be tested, where sand could be sent to show the rate of percolation of water, or where varieties of lime could be tested. The addition of this work to the functions of the college would not impair the educational side of that institution but would rather assist it, as students would be continually in touch with such problems, would take part in discussions, and would benefit by seeing how the experiments were conducted.

947. He suggested that there should be periodical examinations, both oral and written, of Public Works Department officers at eight years' intervals up to the time they had put in twenty-four years' service, so as to keep the engineers in touch with current improvements, even if this involved sending them to England. The superior officers of the Department, the Superintending and Chief Engineers, could superintend this examination. He was of opinion that, even after a man had put in twenty-four years' service, he was capable of improving his knowledge and that there was no time in a man's life when it could be said that he was not capable of further improvement. A somewhat similar system of examinations was followed in the Medical Department.

948. (Mr. Cobb.) He asserted that there was a good deal wrong with the Department. In the first place, a man had too much to do. Everybody was overworked throughout his service, and everybody except the Chief Engineer was under-paid. The latter officer, he considered, was over-paid. That was the reason why good men did not devote themselves more zealously to their duties. If the men were better paid supervision would be more effective. He did not mean that the present supervision was extremely defective, but it tended to become so. If an Executive Engineer did not inspect his works his subordinates committed irregularities, whereas if the supervision was improved no subordinate could impose upon the Executive Engineer. He did not mean to imply that there was want of discipline, but there was want of time on the part of the Executive Engineer for the proper supervision of the work, as he was given too much to do. He had works scattered over a very large area and subordinates, finding that he was not visiting the works, frequently committed irregularities. The witness, therefore, proposed an increase in the number of Executive Engineers, putting one in each of the twenty-two districts.

949. District boards were very inefficient, and nothing would improve their efficiency. The execution of civil works had, he thought, no educative value whatever, and the transfer of the execution of government works to those bodies was unlikely to improve them in any way. The only thing that would improve them was general education, to make them realize their responsibilities.

950. (Rai Bahadur Ganga Ram.) By the expression "What is required is the right man in charge" in his written memorandum, he meant a subordinate who would take the trouble to account for labour employed

and measure the work faithfully and honestly, and an Executive Engineer capable of organizing works. It was the Superintending Engineer who could judge whether these men came up to this standard or not. If it were found that a man was totally unfit for an executive or subordinate charge, the proper remedy was to dismiss him altogether.

951. He considered that the standard of specifications of the Public Works Department for district board works was high, not so much in the case of schools, as of cattle pounds, etc., although in some instances schools were also more expensive than was necessary and could be cheapened by a lowering of the specifications. He would not, however, lower the specifications in the case of police buildings as the inhabitants of a small village were more concerned in looking after the repairs to a school than those to a police station. By saying "The only remedy is to educate the public, so that their culture improves" in his memorandum he intended to convey the idea that the majority of villagers were little removed from savages and, therefore, did not appreciate good buildings. They lived in mud houses and did not care how their buildings looked. Until they improved in this respect the specifications of village schools, etc., might well be lowered to make them conform to the environments of the village.

952. In stating that any extra expenditure involved by the substitution of any other agency for the existing Public Works Department agency should be borne by the Imperial Government, he had meant that, as the Central Provinces was a poor province with little revenue, any additional expense involved in the experiment should be met by the Imperial Government, and the burden should not be thrown on to provincial revenues. He added that this was his personal view, and that he was not speaking on behalf of his government.

953. In explanation of the remark, "The burden of executing local works in the interior of the Central Provinces falls on the subordinate revenue officials who act as stiffeners to local self-government," in his written evidence, he stated that, when a road was to be repaired in a *tahsil* or *taluka*, or an approach to a river *ghat* was to be cut, the local board member for that area was usually asked to see to it. The latter did not generally do so, and after several reminders had been sent to him the work was finally done by the *tahsildar* himself. In this way practically all civil works were carried out by the officials, and the so-called interest which the district councils took was purely imaginary. The district board members never went near their works and the local revenue officials had to do everything, these revenue officials being in fact employed in giving energy to a lifeless mass. He admitted that he was decidedly opposed to local self-government so far as the management of civil works was concerned. He did not think that local bodies should have anything to do with a work, beyond deciding what was to be done and providing the money. Beyond the powers of administrative sanction it would serve no useful purpose to give any more. It was also, he considered, to their own benefit as they mostly did not know anything about an engineer's work, and merely a few made claims to powers, which in all instances they did not know how to exercise. He held that the statement in his written memorandum that the "Roorkee College has ceased in recent years to attract suitable candidates" was perfectly true. He agreed that the market was overstocked but not with the right type of man.

954. As the province was a poor one and could not afford to have a technical college of its own, he had suggested in his written evidence that, in lieu of the one scholarship of Rs. 40 tenable by Central Provinces students at Roorkee, ten scholarships of Rs. 60 per mensem should be substituted, as the cost of living had increased. The average expenditure of a student was, he admitted, Rs. 125 a month.

955. By the expression "original sin" in the following passage in his written evidence "Firstly, if you train a qualified man who is apt, keen, active and reasonably free from original sin, you can train him for sub-divi-

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sional officer's work in one year," he meant habits which could not be easily got rid off, and which were obstacles in the way of a man's deriving full benefit from his practical training. For instance, a man might have lazy habits, be a late riser, too fastidious about his clothes or too fond of games, and be unable to shake off these peculiarities. These came under his classification of "original sin."

956. Petty-contractors were content with a profit of five per cent. only, which was the margin allowed and with which they were satisfied. He could not, however, say how much profit they actually made. The large firm he had alluded to charged 17 per cent. on the value of the quantity of work done calculated at the estimated rates.

957. On being informed that there was a research institute at Poona of which, however, little advantage was taken by engineers, he explained that the Central Provinces was more nearly connected with Roorkee than with Poona College.

958. (*Mr. Mackenzie.*) As a very large number of schools were required all over the country for primary education, the expense of providing schools was practically prohibitive unless the specifications were lowered, and he considered that it would be very much in the interests of primary education if such a lowering were effected.

959. He admitted that he wanted a research institute for "testing" rather than for "original research," and that any engineering workshop might easily be fitted for such work. It would, however, not take up much of the time of the professors and might be useful to the students, and could be done at Roorkee or perhaps at Poona, if there was already a good laboratory there.

960. He knew of only one case of an officer whose promotion had been postponed on account of inefficiency. That officer had since been made Executive Engineer, but his promotion had been postponed for six months.

961. Students coming from the engineering colleges would be able to get a really good practical training if they were employed in various divisions under competent Executive Engineers, who would be given extra allowances for training them. The Central Provinces could probably provide training for six to eight such students, though they could not all be provided with appointments. He considered that such students should pay a fee to the Executive Engineer, and he believed that they would be willing to do so if there was a demand for

their services. This training would be of the greatest advantage to the students.

962. (*Sir Noel Kershaw.*) With reference to the remark in his written statement that "modern products of the engineering colleges in India are more than good enough for 90 per cent. of the work, for which we do not require specialists," and to his suggestion that an increase of salaries was required, he stated that he wanted this increase for the best men of the class only. In spite of the fact that men could be found at the present price, he advocated an increase of salaries as he considered that the best men were deserving of more pay. If people knew that there was no prospect of increased pay for the engineering service the best available talent would cease going to the colleges. The number of the best entrants was diminishing, but they were still living in the hope of such an increase. They had great faith in government, but there was a strong feeling that their pay had been kept back unfairly.

963. (*Rai Bahadur Ganga Ram.*) The witness could not say whether it would be preferable to have a provident fund rather than pensionable service, as he had not thought over the matter. Personally, he would take up private work if he were given a proportionate reward for the service he had put in, and told that his salary would not be increased.

964. (*Mr. Durie.*) The complaints of other departments that there was delay on the part of the Public Works Department in carrying out their works would be greatly mitigated if the departments made up their programme of construction earlier. The present procedure, he thought, was very cumbersome.

965. (*President.*) He had had experience of Berar, having served there for about five years, and on that experience he considered that the local board system was not satisfactory.

966. He was not in favour of the proposal to reduce the number of lower subordinates and to employ practical *mistris* in their place, nor did he think that it would lead to better work. He suggested, however, that more practical training might be given to the lower subordinates. He was of opinion that uneducated men, however skilful, could easily be bribed to pass bad work, and that *mistris* would be more prone to corruption than the lower subordinates, belonging as they did to a lower class. He would prefer that they should not be employed on supervision work at all.

At Nagpur, Tuesday, 23rd January 1917.

PRESENT:

F. G. SLY, Esq., C.S.I., L.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

C. S. COBB, Esq., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member:—

G. A. DURIE, Esq., A.M.I.C.E., Superintending Engineer, Central Provinces.

D. G. HARRIS, Esq. (*Secretary*).

J. DESMOND, Esq., Executive Engineer, Nagpur.

Written Statement.

967. (I) **Economy and suitability of methods of execution of public works.**—The execution of civil works is carried out at present economically, and is suitable to the times, and until the civil practitioner comes into being there cannot be any change. At present there is no private agency which could carry out the works.

968. (II) **Encouragement of other agency.**—When works are sanctioned, tenders are publicly called for, but contractors do not as a rule come forward. Most of the works, therefore, are carried out departmentally. The reason for the dearth of contractors is, in my opinion, due to better supervision by sub-divisional officers and Executive Engineers than formerly. Private agency, as it exists at home, is unknown in India. The Indian

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[Continued.]

contractor, not being an engineer, requires constant supervision, so much so that I find it easier to carry out works without them. It is laborious but saves worry and trouble in the long run. Litigation is avoided and better work is done. Private agency, as it exists at home, is educated and capable of carrying out works without constant supervision which is necessary in India. The contractors there are also practical engineers, and do not require a departmental subordinate staff to lay out and supervise their works. In short, no change can be made until the contractor, or in other words private agency, is capable, as at home, of carrying out works without constant departmental supervision.

(2). The time may come when private agency will be competent to take up public works, but it certainly will not be as economical as at present.

(3). The Public Works Department is not only an agency for carrying out public works, but also a part of the administration, and, as such, I doubt if there is any agency in the world which can compete with it. There is certainly no other agency which could run famines such as those of 1896-1897 and 1899-1900. If such a job was left to private agency, the result would, in my opinion, be more disastrous than the German invasion of Belgium. The members of the Public Works Department are trained in this form of administration which requires sympathetic and timely treatment. Any Public Works Department division is ready to employ something like fifty thousand people within forty-eight hours. There is no private agency which could do likewise in forty-eight days.

969. (III.) **Changes in organization.**—I have no objection to the present system of recruitment of the Public Works Department. I think, however, that the training is defective in both the imperial and provincial services, more especially in the former. A man on arrival in India should undergo a period of apprenticeship for at least a year. Both should submit note books monthly, and they should be examined at the end of the period in local materials, rates, labour, etc. This would give them a better chance of running a work on their own part afterwards instead of depending on their subordinates and contractors. They should have a thorough knowledge of a sub-divisional officer's work, as this is the basis of all construction. If any individual should specialize in any particular branch, I would keep him on that branch and allow him, even after his apprenticeship, to visit other works of the same nature in the division or province. I would not give a man a roving commission, as he then becomes a sort of rolling stone. He should see a work through, from start to finish, and submit a report on what he has learnt. It is the small details which count in India. For instance, it is of more importance to know how much fuel is required to burn a lakh of bricks than to copy plans and estimates of a big work, which he is not likely to carry out or design himself. In cases where men go home for training, the same procedure should be adopted.

(2). Regarding the subordinates of the Public Works Department, I do not think that the recruitment could be improved upon, except that the stiffening of the ranks of upper subordinates from Roorkee by more military men would be an advantage, and, as the Roorkee lower subordinate is the best trained man of his class in India, there should be more of them turned out.

970. (IV.) **Relations with other departments and sub-branches.**—The only branch where I think a change is necessary, is that between the sanitary and executive branch. An Executive Engineer works under the Superintending Engineer of the circle excepting on sanitary works, but when he comes under the Sanitary Engineer he serves two masters neither of whom troubles himself about his work done under the other. I have heard Sanitary Engineers say that they find it difficult to get Executive Engineers to carry out their orders, in the same spirit as they carry out the Superintending Engi-

neers' orders. I have nothing to say against the relations between the Public Works Department and other departments. I always found the latter conducive to economy and rapidity in the execution of work.

971. (V.) **Decentralization.**—I am of opinion that this cannot be done without increasing work and responsibilities of sub-divisional officers and Executive Engineers. There is no doubt that many sub-divisional officers could be given greater powers, but that is not fair to the individual, without increasing his pay and staff. A sub-divisional officer might pay larger bills, but his office staff must be competent to audit and check the bills; at present they are not so, and the auditing, checking and final payments are done in the Executive Engineer's office.

(2). There is no doubt but that private firms pay their men much higher wages than we do in the Public Works Department and, from my experience, I do not find the men employed by firms any better than our sub-divisional officers. Usually, the private individual is a specialist, such as a builder. He would, most probably, be incapable of surveying or laying out a road. Our sub-divisional officers must have a knowledge of all the branches of the profession, and it is remarkable the amount of good work turned out on a very small pay.

972. (VI.) **Simplification of procedure.**—Regarding the Public Works Department Code, I do not consider any change necessary. The rules and regulations are well framed to suit the times and country of which neither has changed as far as Public Works Department work is concerned.

973. (VII.) **Education.**—I consider that the engineers turned out in this country are sufficiently educated for the work they are required to do. They are qualified to carry out works in private employment, but so long as government jobs are available they will not take up private practice, and I do not blame them. As stated above contracting in this country is a very hard work. There are no such facilities as one gets at home. The private practitioner in England, when he takes up a job, a building, calls in the different trades, such as brick-layers, stone-masons, carpenters and joiners, glaziers, plasterers, painters, etc. These trades, I might say, sub-contractors, complete their part of the construction, as the building is made available for them. In India, the engineer, or contractor has to do the lot himself by employing individual tradesmen as daily or piece-work labourers. He will have to make his bricks and tiles, burn his lime, make his mortar and quarry his stone. He must break his ballast for foundations. There are no trade journals to guide him as regards rates, nor is there any recognized market where he can get his materials ready for the work. The amount of trouble involved in carrying out any large work does not, therefore, encourage private agency.

974. (VIII.) **Practical training.**—I would give every encouragement to Indians who have received scientific training, either in England or Indian colleges. Provided that no expense be incurred I would give them a training under an Executive Engineer for two or three years. This has been done in Nagpur. A gentleman was trained here at the expense of a native state. He got a much better training than he would have got elsewhere.

(2). Another man, who applied for training, was sent to this division, but as he was made to understand that he would not get a government job he left after a few months, saying he could not afford to stay on. It was a pity and a case, I think, where a scholarship would have been of great assistance. I have had cases of lower subordinates who have been under training here both in the workshops and on works, and have qualified and gone out on their own part grateful for the assistance given them.

(3). I am convinced that, with government assistance in training, the system of private enterprise will get a start, but I doubt if anything can be done for many years without it.

MR. J. DESMOND called and examined.

975. (President.) The witness stated that he was an Executive Engineer, and had served twenty-four years in

the Public Works Department. The last ten years of his service had been spent in Nagpur.

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976. There had been a number of large buildings constructed in Nagpur during his period of service there, the first with which he was connected having been the new secretariat. Tenders were called for this building, and a large local contractor took it up, but suitable terms could not be arranged for the execution of the ornamental work. The witness, therefore, took over half the building and constructed it departmentally; the contractor was first offered twenty per cent. above the rates which witness had worked out, but refused that percentage. Construction had commenced, and the foundations which cost upwards of Rs. 1,50,000 had actually been completed, when the contractor threw up his contract, the total estimated amount of which was Rs. 10,00,000, making the excuse that he was too old for the job, the real reason, however, being that he was unable to undertake the execution of the ornamental work.

977. The other large building with which he had been connected, and which had been undertaken by a local contractor, was the post office, the estimated cost of which was Rs. 4,50,000. The contractor, however, failed to complete certain parts of this work also and these had to be carried out departmentally; both contractors, in fact, had refused the same class of work although in both cases a rate twenty per cent. above the estimated cost of departmental construction had been offered. These two instances were his only experiences of the employment of large contractors in Nagpur.

978. The hall of the council chamber in Nagpur, which cost Rs. 4,00,000, had been constructed by petty piece-work contract, and, so far as his experience went, much better work was obtained under this system. By petty piece-work contract he meant that all the wood-work in a particular building was given out to a carpenter, the stone work to a mason, and so on, and this was the system invariably followed in Nagpur. In the case of a brick building, however, the whole contract was usually given to a bricklayer at a specified rate. There was no contracting firm in Nagpur capable of undertaking a big work.

979. He was in charge of buildings in the district as well as in Nagpur itself.

980. He thought that it would be an improvement if, instead of road maintenance being executed by departmental labour, a contractor were engaged to maintain a substantial length of road, but no such contractor was available in Nagpur. He had never met a man who would be willing to take up, say, twenty miles of road maintenance. If, however, a contractor could be found to do so, the witness considered that he would require actually more supervision than was at present necessary in order to ensure that the metal was really put onto the road. In any case, consolidation would have to be done departmentally, as no contractor could be entrusted with such work.

981. He had made a provisional comparison of the rates for buildings constructed by private agency, and those for buildings constructed by the Public Works Department, and the conclusion he had arrived at was that the rates paid by private persons were higher than those paid by the Public Works Department. The majority of private persons obtained the materials for the construction of their buildings from the Public Works Department, and were even ready to pay that department ten per cent. more for certain classes of materials, such as bricks and lime, than they would have paid in the open market.

982. With regard to the feasibility of a system under which all work in a particular district should be given out to a large contractor for a term of years, the witness stated that he had tried a similar method elsewhere, in connection with the collection of metal for roads. He had advertised, and had sent out a circular letter to all the villages in the district, asking people to take up lengths for a certain number of years, but he did not get a single reply from anyone. He was of opinion that the present method of construction and maintenance of roads was as economical as possible.

983. The rate charged for bricks was the actual cost of manufacture, including all capital costs, and the cost of

acquisition of land. In fact the rate charged included everything except a sinking fund.

984. He was *ex-officio* member of the Nagpur Municipality, and the rates paid by that body as well as those paid by the district council for the execution of works were practically the same as the Public Works Department rates.

985. He thought that municipalities and district boards, instead of having a certain number of their works carried out by the Public Works Department, should construct the whole of their work themselves, but at the present time their staff was insufficient for the purpose.

986. In connection with the proposal that not only should municipalities and district boards do all their own work but should, in addition, undertake government works also, he explained that these bodies had not at the present time a sufficiently trained staff, and that, consequently, the roads would deteriorate in a very short time. If, however, an adequate staff were engaged, it would simply mean the transfer of works from the Public Works Department to these bodies, and even in that case the same Public Works Department staff would be required with the result that no saving at all would be effected.

987. He did not agree with the suggestion that repairs to all government buildings should be done, not by the Public Works Department, but by the department actually in occupation, for example that the Revenue Department should look after the repairs to all *tahsils*, and that the Police Department should be responsible for the repairs to police stations, etc. Such repairs, he thought, would not be carried out either so well or so cheaply as if they were done by the trained staff of the Public Works Department. Even if the maintenance and repairs of such buildings were taken out of the hands of the Public Works Department, he did not think that they would be very much relieved. Although the expenditure in this connection was already large, he thought that it would be still larger if it were done by the departments concerned, but his chief objection to the proposal was that the buildings would not be kept in such good repair.

988. He thought that some change was necessary in regard to the relations between the sanitary and executive branches of the Public Works Department because, in the construction of a large sanitary work, the Executive Engineer had frequently to serve simultaneously under the Sanitary Engineer and the Superintending Engineer. He was, therefore, subject to two different departmental heads which fact was apt to cause difficulty.

989. He considered that the present system for obtaining administrative sanction was quite suitable. He had not found any difficulty in this connection, nor had he experienced much inconvenience owing to the administrative officers making unnecessary alterations in plans after sanction had been accorded, thereby necessitating revised plans and estimates. He could quite understand a medical officer, for example, even though he might have approved the original details, changing his mind in regard to the design of a medical school; such a contingency must be expected.

990. For the repair of government buildings in Nagpur they had standard detailed estimates, *i.e.*, standard measurements of the various classes of work to be done in each building. For colour-washing plans and estimates were not required, as the totals could be taken direct from the measurement book. He had complete power over the allotment he received for repairs to buildings in his division, and was authorized to spend it as he thought fit, provided he did not exceed the allotment for any particular class of buildings. He did not, for example, think he could spend any portion of an allotment which had been sanctioned for repairs to police buildings on an educational building, but the sanctioned allotment for police work could be spent on any particular police building.

991. He had powers of technical sanction up to Rs. 2,500, and considered that the work of a Superin-

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tending Engineer would be reduced, and more opportunity given to him of really supervising his circle if the powers of the Executive Engineer were increased. It was true that occasionally Executive Engineers had only three or four years' service, but he considered that so long as they were competent larger powers should be given to them, as this would result in a reduction of office work all round. The Executive Engineer should be empowered to accord technical sanction up to Rs. 10,000 on original works designed by him, and up to any amount on works constructed on standard plans.

992. By giving sub-divisional officers better pay a better class of men would be obtained. The present class was inferior, this being due to the fact that a good many sub-divisions were manned by lower subordinates instead of by upper subordinates. Even if upper subordinates were always placed in charge of sub-divisions he would not give these officers more power than they had at present, as they were very poorly paid—their salaries varying from Rs. 100 to Rs. 450 a month, and yet they were entrusted with the expenditure of lakhs of government money. He was of opinion that it was more pay, and not more power, that was required in their case.

993. He was not, from the accounts point of view, in favour of the suggestion that, in order to simplify procedure, the standard for minor works should be raised from Rs. 5,000 to Rs. 10,000; such a course would not tend to improve matters, as the accounts of minor works were not kept in detail, and hence there would not be so much check as at present existed.

994. He did not think that the accounts of the Executive Engineer were unnecessarily complicated, or that they caused so much work as to interfere with the other duties of that officer. The witness spent most of his time on his works, and not in the office. He spent, perhaps, a couple of hours a day on his accounts throughout the month. On the first days of the month, however, when he had to submit his accounts, he had to spend more time in his office. During this period the proportion might be unreasonable, but it was nevertheless necessary. The accountant did the compilation of the monthly accounts, but the Executive Engineer was responsible and had to check and sign them. When the monthly accounts were put up to him he had to sign his name some hundreds of times, but he checked only the most important items.

995. The present audit system did not, in his opinion, create unnecessary work; he had no objection to a fair and square audit. The percentage of objections was very small, as was also the amount of time he had to spend on them. He had no criticisms to make on the present system.

996. He had had a good deal of experience of engineers turned out from the Roorkee College and had found them very good men. Their theoretical training was always good. He himself had received his training at the Roorkee College. He did not agree that, in the case of upper subordinates, the theoretical instruction given to them was in excess of the requirements of the work which they had to perform, and he would not reduce this theoretical training, but he considered the men themselves were deserving of more pay and had sufficient knowledge to demand it.

997. He considered that all men passing out of the Roorkee College, whether they entered government service or not, should receive a practical training of two years instead of one, and believed that every Executive Engineer could find time to give this training to passed students. He himself would be prepared to take a certain number of apprentices.

998. He would give the Assistant Engineer undergoing practical training a living wage of Rs. 100 a month, the upper subordinate Rs. 50 and the lower subordinate Rs. 20. He thought that every man who had passed out of a government college should be thoroughly trained, and not be turned adrift on the world half trained and unable to secure a job; he recommended that a stipend should be paid to them by the Education Department. The Public Works Department was, he thought, in a

position to give a practical training to all passed students of engineering colleges. They could be made use of while undergoing this practical training, and in their second year the Public Works Department might give them a small stipend for the work they did.

999. He had had a good deal of experience of lower subordinates, and was absolutely opposed to the proposal that the Public Works Department could be organized on better lines by the substitution of *mistris* for the present class of lower subordinates, the object of that proposal being apparently that practical craftsmen such as masons and others should be put in charge of the duties at present performed by sub-overseers. He explained that these sub-overseers were capable of laying out works, surveying and estimating, which the *mistri* would never be able to do. He himself employed lower subordinates on the surveys and preparation of plans and estimates for all roads. The *mistris* in Nagpur were not craftsmen; they usually commenced as time-keepers and rose to be *mistris*. They were in no respects master masons and carpenters. This class of man was utilized by the Public Works Department, when they had a job to do on piece-work, and wanted someone to look after a certain number of masons; in that case they usually chose the best *mistri* for the purpose.

1,000. In addition to his permanent establishment he employed a certain amount of "works establishment" on buildings. The latter establishment consisted of *mistris* or time-keepers, and they were not continuously employed. They were taken on for a particular work and when that work was completed they were dismissed. When more than one work was under construction at the same time they were occasionally transferred from work to work.

1,001. He did not think that it would be feasible to introduce a system under which a certain percentage of the temporary "works establishment" would be converted into a permanent pensionable service.

1,002. (*Mr. Cobb.*) The Public Works Department was not only an agency for the execution of public works, but was also an administrative department, in that they carried out works in the case of famine. Although the latter works were carried out under the orders of the Revenue Department, that department only decided the locality in which they were to be constructed and the Public Works Department, being the administrative department concerned, decided what works were to be done.

1,003. He did not think it would obviate delay if each department were made responsible for carrying out the repairs to its own buildings.

1,004. In regard to the supervision in connection with repairs to roads, he explained that the stacks of metal collected by the contractor for such repairs were actually measured up before the metal was spread. The sub-divisional officer was responsible for the supervision, but whether he could always be trusted or not was rather a difficult question to answer. He in turn was supervised by the Executive Engineer, who passed the final bills, and who had before him the road metal statement, showing the amount spread and the balance on the road side. This statement was kept in the office of the Executive Engineer. The bills for metal were paid by the middle of June, before consolidation had commenced.

1,005. (*Rai Bahadur Ganga Ram.*) He did not know the plinth area cost of the Bansi Lal Bank in Nagpur. This building had been designed and constructed departmentally, under the petty-contract system, by an engineer who was the late Secretary to the Civil Station Sub-Committee. The building was standing alright, but the cost of construction had been increased owing to the bricks having been obtained from the Public Works Department, with the usual enhancement of 10 per cent. over stock rates. Octroi duty had also been paid on the stone and other materials coming from outside, whereas the Public Works Department were exempted from payment of such duties.

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1,006. With reference to the difficulty, previously referred to, that the Executive Engineer had to serve two masters when engaged on the construction of sanitary works, he explained that when the plans and estimates were in the hands of that officer he was quite capable of carrying out the work, and hence he considered that once a project was sanctioned its construction should be left entirely to the Executive Engineer.

1,007. In regard to correspondence, he stated that as a rule he wrote the originals of all letters, and the office typed them, the originals being kept as office copies. If his accountant drafted a letter, the witness initialled it and a copy was kept. Last year the number of receipts and issues totalled about eleven thousand each. A separate number was given to reminders, but these were very few and did not materially affect the totals.

1,008. He was aware of the fact that a *mistri* class had once been started at Roorkee, but did not know why it had been discontinued. He did not disapprove of the *mistri* class being revived, but thought that if a little general education was given to them they would be more useful.

1,009. (*Mr. Mackenzie.*) There was not, he thought, anything special about his division to which could be attributed the small number of objections raised in regard to his accounts by the audit department. It was simply a matter of management.

1,010. (*Sir Noel Kershaw.*) The contractors in England, referred to in his written evidence, were not trained engineers, but had gained their knowledge of engineering by experience.

1,011. Generally speaking, he thought that departmental repairs to police buildings, in out-stations, could be more satisfactorily and quite as cheaply carried out by the Public Works Department.

1,012. In regard to the delegation of powers to upper subordinates, which he had not been able to recom-

mend on the ground that their pay was insufficient, he did not agree that it was a question of more training and not of more pay being required. It was not fair to give a man a job for which he was not paid sufficiently well. He admitted, however, that these men underwent their training with full knowledge of the prospects before them, and of the fact that their chances were limited. They were aware of the distinction between the Assistant Engineers and the upper subordinates, but the fact was that the latter were actually doing the work of Assistant Engineers, in other words, their pay was limited, but not their work.

1,013. (*Mr. Durie.*) The Nagpur Quarter Guard House was built departmentally, by the Police Department, at a cost of Rs. 13,974 against the Public Works Department estimate of Rs. 13,940. The Police Department took up the work as an imprest holder, but supervision was exercised by the Public Works Department. The Police Hospital in Nagpur was built at a cost of Rs. 11,000 against the Public Works Department estimate of Rs. 20,000. This estimate was not officially prepared by the latter Department, but was obtained informally by the District Superintendent of Police. The construction was supervised by the Public Works Department, and the witness had not seen the estimate, which had been sent direct to the Inspector General of Police. Had the Public Works Department prepared the estimate, officially, it would probably have amounted to practically the same as the actual cost. The actual details were not traceable from the expenditure statement; for instance the supervision charges were paid by the Public Works Department, while the *mistris*, sub-oversers and water-supply, etc., were paid for by the Police Department. The latter also employed police labour in the construction of the building, which probably made a slight difference.

The HON'BLE MR. R. C. H. MOSS-KING, I.C.S., Inspector General of Police, Central Provinces.

Written Statement.

1,014. I presume that I have been called on to give evidence as representing the Police Department, and because that department has fairly extensive requirements in the way of buildings, and I am, therefore, in a position to say something as to how these requirements have been met under our existing methods of work. One very important point to which inquiry is being directed is whether the existing system sufficiently encourages private enterprise and whether it is possible and desirable to entrust public works to agency other than departmental.

1,015. So far as I am aware the Public Works Department work entirely through contractors. They perform the part of the architect in framing designs and estimates, and for the rest merely control and supervise work which is done by private contractors. The present system would therefore seem to encourage private enterprise in the form of what, at any rate for the Roads and Buildings Branch, I believe, I am correct in describing, as petty contractors. As regards the possibility and desirability of replacing departmental by some other agency, which must presumably be private agency, I am totally unable to say anything. The Police Department has never employed any such agency hitherto, and we have no data or knowledge whatever on which to base any opinion or comparison. I propose therefore to confine myself to a consideration of the existing system and agencies by which our work is being done at present.

1,016. The position in regard to police buildings is not uncomplicated. There are three agencies employed in their construction, repair and maintenance, namely the Public Works Department, the divisional local fund and the Police Department itself, on the respective books of which all our police buildings are borne. These "book" entries have nothing to do with the initial construction, they merely assign the responsibility for maintenance and repairs after construction, i.e., the Public Works Department may construct a building which is

then transferred to the police "books," thereby making the Police Department responsible for its maintenance and the provision of funds therefor. With ordinary police expansion, more and more buildings have been transferred to the "books" of the Police Department, the general principle adopted in these transfers being that this department could more easily maintain buildings which were not conveniently accessible to the Public Works Department. The Police Department also have departmental powers of construction up to Rs. 2,500 (Appendix B B B B, Civil Account Code). Recently with the introduction of the divisional local fund scheme which came into practical effect from about 1915, the local fund has been added as a third agency concerned with police buildings. The principle followed in the distribution of buildings among the "books" of these three agencies is :-

Divisional local fund.—Certain roads have been handed over to their charge and buildings on these roads are on their books. Buildings at 116 places are now on the local fund books.

Public Works Department.—This Department has on its books buildings which are at headquarters of districts, and which are easily accessible by road or railway.

Police Department.—The Police Department has the remainder on its books, taking over these buildings which neither the Public Works Department nor local fund want or can suitably arrange to have in their charge. The distribution of buildings among the books of these three agencies is not based on any money limit.

1,017. Buildings are divided into three classes—

(i). *Major works* include all buildings costing over Rs. 5,000; these are constructed solely by the Public Works Department.

(ii). *Minor works* cover all buildings costing up to Rs. 5,000. These are constructed either by the Public Works Department or the local fund, the agency employed depending on the "book" division mentioned above.

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(iii). *Petty construction and repairs* is in practice only a separate nomenclature for minor works costing up to Rs. 2,500 which are done by the Police Department for buildings on their own books. What the Police Department do as petty construction would be a minor work if done by the Public Works Department or local fund.

1,018. *Budget provision*—

Major works.—All buildings to be constructed are provided for in detail in the Public Works Department budget.

Minor works.—A lump grant, usually Rs. 30,000, but liable to variation according to financial considerations, is provided in the Public Works Department budget for works to be done, both by that Department, and the divisional local fund engineer.

Petty construction and repairs.—A sum of about Rs. 60,000 is included in the police budget for departmental construction work, and also for annual repairs to buildings on police books as well as those on the books of the local fund. The Public Works Department also include in their budget a lump grant for all buildings to provide for annual repairs and maintenance of buildings on their books.

1,019. *Sanction*.—Administrative sanction is necessary for all major works and holds good for three years. Minor works can be sanctioned by the Inspector General. As regards plans and estimates, they are for major works prepared by the Public Works Department and are sent up by the Superintending Engineer for administrative approval of the Inspector General after which they are sanctioned by the Superintending Engineer. For minor works, they are prepared by the Executive Engineer and are sanctioned by the Inspector General, but, if the cost of the work is between Rs. 2,500 and Rs. 5,000, the professional approval of the Superintending Engineer is necessary. For petty construction works, the contractor prepares or gets prepared the plan and estimate which is sanctioned by the District Superintendent of Police.

1,020. It will be observed that any specified work which does not cost more than Rs. 2,500 can be done by either the Public Works Department, the local fund or the Police Department. The position can best be explained by an example. A sub-inspector's quarters is wanted at a cost of about Rs. 1,800. If the place where the building is required has government buildings on the books of the local fund, the work can be done by that agency and the cost be charged against the Public Works Department minor works grant. If not, it can be done either by the Public Works Department, as a minor work, or by this department as petty construction. There is no fixed principle by which it is laid down that the Public Works Department or the Police Department must do such a separate *new* work. It is only a matter of funds, and the Inspector General may, if he has sufficient funds under Public Works Department minor works, have the building constructed by the Public Works Department or he may get the work done by this department as a charge against "*Petty construction and repairs*."

1,021. If, however, the work happens to be additions and alterations to existing buildings, e.g., four extra quarters added on to a set of constables' quarters at a station-house, the agency which carries out the work must be that on whose books the buildings are borne.

1,022. Annual repairs and maintenance, e.g., white-washing, repairs to walls, windows, tiles, etc., are done by all three agencies. The Public Works Department maintain out of the lump grant for "*repairs*" in their budget all works on their books. From the budget grant of "*Petty construction and repairs*" under Police, both the Local Fund and the Police Department maintain their respective "*book*" buildings.

1,023. Petty works may be either original or repairs. Paragraph 645, Volume I, Public Works Department Code, defines the distinction. What this means is that any work, however petty, or a building on the Public Works Department or local fund books which does not exactly follow the standard plan on which the building was originally built, is an original work and must be done as a minor work and not as a "*repair*" e.g., flag-flooding to the verandah of quarters built under a plan

only providing for rammed *murrum*, the substitution of Mangalore tiles for country tiles, the provision of an extra skylight or ventilator and so on. In this connection, it may be noted that it is quite immaterial that the standard plan may subsequently have been altered. For example, the standard plan for sub-inspectors' quarters now allows of flag-flooding while the older plans allowed of improved cement and so on. But if we want to "*repair*" the broken cement floor of an old sub-inspector's quarters on the local fund books by replacing it with a flag-flooding, we cannot do it as a "*repair*" or provide the money from our "*Petty construction and repairs*" grant: it has to be done as an original work and the money provided from the minor works grant. That grant may be exhausted, and we may have money to spare in our "*Petty construction and repairs*" grant, but this is no good. By the Code it is an "*original*" work and must be treated and provided for under its own proper head. If the work, however, follows the original plan it is a "*repair*" being paid for by the Public Works Department if the building is on their books, or from "*Petty construction and repairs*" in the police budget if it is on local fund books, e.g., replacing on the same plan the roof of a station-house blown down in a storm, re-tiling with the same kind of tiles. For buildings on police books there is no such distinction between original or repair works.

1,024. Finally, residential quarters for gazetted officers and offices of the District Superintendents of Police are under the control of the Commissioner of the division, and the Inspector General of Police has nothing to do with them or the funds, beyond giving his formal approval to any project.

1,025. District Superintendents of Police regularly submit their requirements for major works. From these requisitions works are entered up into a general programme, which we call the "*B*" programme, under the orders of the Inspector General. Each year this general programme is taken up and works selected are brought on to another programme, the "*A*" programme, in an order of urgency. In May every year the Inspector General selects works from the "*A*" programme for inclusion in the ensuing year's Public Works Department budget on intimation from the Chief Engineer of the probable grant for that year. The Public Works Department budget is discussed at a conference at Pachmarhi in June, and approximate grants apportioned to departments. As soon as a work is brought on to the "*A*" programme, administrative sanction is applied for, the cost being worked out approximately according to standard estimates. When a work is taken from our "*A*" programme for inclusion in the budget, the Public Works Department are asked to prepare stage II plans and estimate, and this is invariably about 6 to 9 months before the following financial year starts. A statement of works in progress is received from Superintending Engineers on the 5th November, and this shows whether the full allotments are likely to be spent in that year. With this as a basis, a final programme of works is made out and sent to the Public Works Department Secretariat on the 15th November for inclusion in their final budget estimate. Meanwhile, plans and estimates have been prepared by the Superintending Engineers, and are approved and sanctioned as they come up. In regard to site plans the District Superintendents of Police are told to arrange for selection of sites as soon as a work is administratively sanctioned, with a view to there being no delay in starting work in case any land or buildings have to be acquired. The committee for selecting a site consists of the Deputy Commissioner, Civil Surgeon, Executive Engineer, and the District Superintendent of Police, or their representatives, and the site plan has to be approved by the Superintending Engineer, Inspector General of Police and the Commissioner of the division. When the Public Works Department final budget estimate is out, the necessary allotments are given to Superintending Engineers who arrange with the Executive Engineer for the commencement of works. This is usually in April or May. We have nothing to do with the final detailed stage III plans and estimate unless the original

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estimate is materially altered. General rules in regard to procedure are in Book Circular III-27.

1,026. In regard to "minor" works costing not more than Rs. 5,000, Deputy Inspectors General maintain a programme of works and have powers of sanction for works costing up to Rs. 2,000. Works exceeding Rs. 2,000 and up to Rs. 5,000 are included in a programme maintained by the Inspector General in consultation with Deputy Inspectors General. Plans and estimates are prepared by the Executive Engineers as soon as a work is brought on to a programme, and they are kept pending in this office until funds can be allotted. The standing Public Works Department budget for police is Rs. 30,000, this varying more or less according to funds available. Immediately we know what money we have, the Inspector General allots to Deputy Inspectors General a certain amount keeping the balance for himself. Works are then selected and plans and estimates sanctioned, allotments placed at the disposal of the Executive Engineer and district officers informed.

1,027. In regard to residential buildings i.e., buildings which are *not* rent free, e.g., quarters for a circle inspector, administrative sanction has to be obtained for all new works and that of the local Administration in the Public Works Department for any additions or alterations (Public Works Department Manual, Volume I, paragraph 24). For example the Police Department in the Secretariat has to be addressed to construct a circle inspector's quarters; the local Administration in the Public Works Department has to be asked to sanction such things as a bathing platform, water-pipe, skylight, etc.

1,028. A monthly progress report of expenditure and a completion report is prepared by the Public Works Department, passed by the District Superintendent of Police and filed in this office for minor works (Public Works Department Code, Volume I, paragraph 824).

1,029. The local fund engineer scheme was started in 1913. Under this system, which came into practical effect about 1915, certain police buildings have been made over to the local fund and any additions or alterations to these buildings (minor works) and new minor works are done by the local fund engineer and his staff, who are paid by the district councils and are under the control of the Commissioner. The divisional local fund engineer prepares plans and estimates and when the Inspector General or Deputy Inspector General sanctions a work the Finance Department is asked to transfer funds from the Public Works Department to the Civil Budget. Major works have not yet been given for construction to this agency.

1,030. Repairs are also done by the divisional engineers for buildings at 116 places in their charge. The money for this is included in the police budget under "Petty construction and repairs" and allotted to District Superintendents of Police who issue transfer receipts to the district council as required for presentation at the Treasury in exchange for cash.

1,031. The standard cost of buildings is that of the Public Works Department. The estimate for every work is increased by 11½ per cent. to cover the cost of establishment and tools and plant, and any savings effected on any work are retransferred to the Public Works Department minor works head.

1,032. As a private departmental matter, the police have been instructed to prepare and submit to the Inspector General periodical returns of inspections of police buildings by divisional engineers and their subordinates.

1,033. Appendix BBBB of the Civil Account Code allows of any work costing up to Rs. 2,500 being done departmentally by the police. The procedure is that District Superintendents of Police submit annual lists of works required and according to funds available the Inspector General first allots money for 'repairs' proper and the balance is divided between the two Deputy Inspectors General who allot money for construction of certain definite works. The normal amount of departmental work done is from Rs. 15,000 to Rs. 20,000 a year on original construction. During 1907-1910 a much larger amount of work than usual was done by the police owing to relocation of districts. In the Nagpur

district an experimental scheme has been in force from 1907 by which all original works and repairs to all police buildings are carried out departmentally up to the limit of Rs. 2,500 and in this district the Public Works Department have transferred all buildings to the books of the police.

1,034. The department on occasion carries out work costing more than Rs. 2,500 acting as an imprest holder for the Public Works Department. In such cases, which are not common, the District Superintendent of Police has to keep to the Public Works Department plans and estimates. The Nagpur Lines Quarter Guard was built by us in this way.

1,035. The Police Department spend about Rs. 25,000 to Rs. 30,000 a year on annual repairs proper, which include white-washing, tile turning, replacing broken wood work or flag-flooring and any portions which have been broken down. Except in the Nagpur district, we only do repairs to works on our own books.

1,036. Such being the existing system with regard to police works, it remains to consider whether it is an economical and suitable one. To take our own Police Department agency first, I think we can claim for it that it is economical, at any rate in initial construction, and it has the merit of simplicity, there being no complication of accounts, no administrative sanctions or various stages of estimates involved. For economy, I would cite the following instances:—

(1). Station-house Malthone, Saugor district, built for Rs. 2,000 against the Public Works Department estimate for a similar building for Rs. 3,700.

(2). Nagpur Quarter Guard built at a cost of Rs. 13,974 against the Public Works estimate of Rs. 13,940, but the work included several extras not provided for in the estimate, such as extra skylights, a clock and clock tower, (the clock alone costing Rs. 700) distemper colour-wash, better doors, etc.

(3). The Police Hospital, Nagpur, built at a cost of about Rs. 11,000 against the Public Works Department estimate of about Rs. 20,000.

One reason for this economy is that at headquarters, the police can use for unskilled labour like levelling and digging of foundations their own labour at a cheaper rate than can be paid to ordinary *coolis*. Moreover, we deal direct with the producer and do not have to pay middlemen's profits. For example, for bamboos, *ballis* and timber we go direct to the Forest Department and not to a contractor. But while perhaps this advantage of economy may be urged in favour of departmental work at headquarters, I am not at all sure that it can equally be urged in favour of work done out in the districts. Moreover, the quality of the work must depend very largely on the personal equation of the District Superintendent of Police who may or may not be a practical commonsense officer and interested in the work, but has of course never any technical qualifications. It is a fact that most District Superintendents of Police have a strong objection to being entrusted with departmental building work, and with that objection I sympathize. It is not our work as police officers; we are liable to be blamed for faulty work and yet none of us have any technical experience or knowledge. I do not feel at all certain that, at any rate for buildings out in the *mo/ussil*, our departmental work is necessarily economical in the long run. I am inclined to think that repairs and maintenance of departmentally-built works probably cost more than they should, though it is impossible for me to obtain any actual evidence to that effect from figures and records available. I have already mentioned special conditions existing in the Nagpur district and I may note that the District Superintendent of Police backed by the Deputy Inspector-General has just submitted proposals for handing back to the Public Works Department the maintenance of the buildings which were, and ought to be normally, on their books and in their charge. Departmental building adds very considerably to our office work. Generally speaking, so far as I can judge, I believe it to be more or less a fact that such work as we have done up to date has been on the whole satisfactory, but I should be inclined

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to ascribe this more to luck than to judgment, and I do not think that as a department we can ever feel really confident of avoiding blunders in our building. With a cost limit of Rs. 2,500 such blunders may not be very serious and I do not think that under existing circumstances our departmental agency can be dispensed with, but I should deprecate any extension of its employment on the ground that we have not and never can have the necessary knowledge.

1,037. As regards the local fund agency, the scheme has not yet had time to settle down and I have not sufficient experience of it at present to formulate any definite opinion as to its success or failure, but I may remark that the 11½ per cent. addition to the estimate, which I have already mentioned, is bound to make it an expensive agency from our point of view. Inspection returns have up to date indicated generally that inspection and control is not altogether satisfactory, which is probably due to the staff being insufficient or to its having too large a charge to look after. The procedure and accounts would also seem to be susceptible of improvement *vide* paragraphs 1,029 and 1,030 *supra*. For minor works it would seem simpler for the Comptroller to adjust the cost by book transfer from Public Works Department minor works to the Civil Budget "Contributions to local funds" and eliminate the Inspector General and the Finance Department altogether. In the case of repairs, a simpler method would similarly seem to be for the Comptroller to adjust the amount as a direct contribution to the local fund from the Public Works Department and thus relieve the District Superintendent of Police of anything to do with what does not seem to be really any concern of his.

1,038. Coming to the Public Works Department, I do not think I can say anything as to its economy or otherwise. Taking the percentage for the last four years, 1912-13 to 1915-16, of the two heads "establishment and tools and plant" on the total roads and buildings budget I work out that government is paying for supervision from 16 to 18 per cent. on the value of work done. To this would have to be added something for the Public Works Department accounts branch, which I believe costs some Rs. 65,000 a year and part of which must at any rate be debitable to the Roads and Buildings Branch. Whether this is a cheap rate to pay for supervision I have no means of judging and only an engineer could be competent to express any opinion as to whether the Public Works Department rates and specifications are economical or not or testify to the actual quality of their work in relation to its cost.

1,039. As regards suitability, our police requirements while fairly numerous are individually small. Practically none of our works outside headquarters cost more than Rs. 10,000 to Rs. 12,000 and many of them much less. It is only occasionally for our headquarters lines a *d kctualis* that we require works running into the twenty or thirty thousand rupees. Moreover most of our requirements are at places out in the districts, often remote and difficult of access and whatever agency we employ for our buildings we must have one capable of meeting what I imagine to be these, somewhat adverse conditions. Personally I think that the Public Works Department can probably be as suitable an agency as any other from our point of view. It is obviously very difficult for a layman to criticise the work of a technical department, and I hope that it will be understood that in making any remarks on the subject, I am speaking purely as representing a department which has to occupy the buildings constructed by the Public Works Department and has at any rate that not unpractical claim to a voice on the subject. I would also wish to acknowledge the large amount of very excellent work which has been done for us by the Public Works Department in the past and the cordial assistance we have received on many occasions from its officers. We have, however, in practical working noticed various points which, rightly or wrongly, appear to us susceptible of improvement and I would mention the following:—

(1). *Waste of time.*—The Public Works Department final budget is known early in April but actual work on

new buildings included in it is not started at once. My records and reports from Executive Engineers show that in the first quarter of the year practically no work is done not only on new works but even on incomplete works left over from the previous year. In practice work is not started in earnest until after the rains or at the beginning of the cold weather. This may possibly be due to some delay in the communication of allotments between the offices of the Chief, Superintending, and Executive Engineers and to the lower subordinates, but what it means is that six months in the year are more or less wasted and the Public Works Department have accordingly only about half a year to get through a full year's work. The result is that we get large sums surrendered from new works on which the Public Works Department are unable to spend the full allotments. As late in the year as November the budget of the succeeding year is framed on reports from Executive Engineers showing how much they can spend in the current year, and yet not three months later we get money given up of which no use can be made and which lapses to government, and the programme of works for the ensuing year has to be recast. This means that either allotments originally designed for new works have to be reduced or some of the less urgent projects cut out to find money for works in progress for which the money provided in the previous year has not been spent. If the Public Works Department year were altered to commence say from 1st October there would be the whole open season to get through the major portion of the work while finishing inside buildings could be done during the rains. There ought not then to be much excuse for surrenders of grants and if any were anticipated it should be possible to intimate them in the hot weather so that any petty works could be taken up out of these savings.

(2). *Delay in starting work.*—The present procedure by which works are selected, included in the budget, site selected, funds allotted, works started is most cumbersome. It is true that it is the exception that there should be any hitch in the preparation of all these multifarious preliminaries leading to the actual commencement of work, but the fact remains that these preliminaries involve the lapse of many months before work can actually be started on a major work. The money limit for minor works is Rs. 5,000. It is not known on what principle this limit was fixed. It would, however, simplify procedure enormously if the limit were raised to say Rs. 10,000. This would allow of practically all our ordinary requirements, station-houses and quarters, reserve inspectors quarters and so on, being taken up as minor works and we should only require very few major works in connection with headquarters lines.

(3). *Surrenders and lapse of money.*—I have already mentioned how surrenders are made often late in the year and without notice and when no use can be made of them. Even when communicated reasonably early the Public Works Department are often unable to suggest any works to which they can be transferred, although when no such suggestion is made by them we inquire whether such a course is not possible. All these surrenders lapse to government which seems to be unbusinesslike and certainly not tending to economy. What it does tend to is a hurried expenditure, possibly injudicious, in order to try to avoid a lapse. No allowance on account of any provision that may have lapsed during one year is made during the following year. It simply means that the Police Department loses for good and all certain money which the Administration intended it to have the benefit of, and this through no fault whatever of its own, and we never get our budget increased on account of lapses. Whether this can be altered I cannot say, but I venture to maintain that it is an unbusinesslike and inadvisable system. I give a few examples of surrenders made by the Public Works Department.

(a). Patharia station-house and quarters, Bilaspur district, under construction.

This was urgent work for which full amount was provided. The Public Works Department have surrendered Rs. 5,900 saying that the sanction to start work came too late for collection of any materials before the rains. It

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is not stated whose fault this was. This sum will have to be provided for in 1917-18. Meanwhile we have been able to transfer Rs. 4,500 of this money to two other works.

There is another similar case of quarters at Ansingh in the Akola district.

(b). Manora quarters, Akola district, under construction. This work was of an urgent nature and we had provided Rs. 11,250. The Public Works Department specially asked for a big allotment to have it nearly completed during 1915-16. But at the close of that year they surrendered Rs. 6,500, saying that the work was delayed by shortage of labour owing to cotton season. Funds had therefore to be provided in 1916-17.

(c). Palari station-house and quarters Raipur district. This work was of an urgent nature and we had provided the full amount of Rs. 10,500 with a view to its being completed this year (1916-17). The Public Works Department surrendered a sum of Rs. 4,500 saying that it was not required this year, no reasons being given. This sum will have to be provided again in 1917-18. We have been able to transfer Rs. 1,200 out of this saving to a work in Drug.

(d). Nimbola station-house and quarters under construction. This work was selected as necessary by the Inspector-General in 1913, but could not be taken up owing to want of funds till 1916-17. Meanwhile a site was selected and plans and estimates sanctioned. The Public Works Department have surrendered Rs. 4,000 out of the allotment of Rs. 9,900 and I have just now, at the moment of writing, received the following report on the subject from the Deputy Commissioner, Nimar.

"The site for a station house at Nimbola was first selected as far back as December 1913. The Executive Engineer sent up a draft notification for the acquisition of land in May 1915. In June following he was asked to have the land demarcated. This he did in March 1916. Then it was found that the site selected was unsuitable. Another site was selected in September 1916. This time the Public Works Department prepared a wrong plan. An objection was also filed by the owner of the land. A corrected plan has just been received and I think the land should be formally acquired by the end of February 1917." The Public Works Department are unable to suggest any other work on which they can utilize this saving during the current year and the whole Rs. 4,000 will therefore have to be re-provided next year.

(4). *Restrictions of the Public Works Department Code.*—These are on occasion meticulous to a degree that practically hampers work. I refer to paragraphs 1,023 and 1,027 *supra* for the kind of thing I mean.

(5). *Repairs.*—As already stated the Public Works Department include in their budget a lump provision for repairs for all buildings in their charge. We know nothing whatever about the expenditure of this money. We do not know how much any individual Executive Engineer is allotted, how much of this allotment he earmarks for police buildings or how he spends it, whether in total or in detail. It is not open to us to know whether in any one year repairs of police buildings have had to give way to repairs of buildings of other departments, or if we knew it to make any protests. From our point of view this is not business.

(6). *Savings.*—For major works we know nothing at all about savings made on the allotments. At present any such savings are I understand added to the Public Works Department general reserve by the Chief Engineer. For special reasons the Inspector-General can obtain a grant from this reserve, but there is no earmarking for police purposes of any savings of money intended for police benefit. Similarly in the case of minor works the progress and completion reports which for Public Works Department minor works come to the Inspector-General's office for record are useless: our records shew that the completion certificate often comes so long as a year late, and the report of the final cost of the work even later, when the year has long closed and all savings have of course lapsed. It is true that any minor works savings are generally small on any one work, but collectively they are always to be found useful. It may not be possible in all cases

to intimate savings in time for their utilization elsewhere, but it should presumably be possible in some cases and savings would seem legitimately to belong to us. At present, we never get a chance of using any.

(7). *Absence of competition and of any forfeit or penalty.*—These are factors which in general operate in favour of efficiency. I confess that I do not see how they can be introduced in respect of any government agency, and this is probably a defect inherent in the employment of every such agency. It is apt to operate hardly against the customer department. I would instance the Pinjar police buildings in the Akola district built in 1911-12 and quarters at Kamptee built in 1912-13. In both these cases, soon after the completion of the buildings, cracks were noticed and in order to prevent further cracking the Public Works Department submitted estimates for "improvements" in the form of sand casing round the foundations, which possibly ought to have found a place in the original specification. As to this or where exactly the fault lay it is not for me to say but at any rate it would appear to lie with the building and not with the customer department. But all that happens in such cases is that the Police Department has to find the money which it can ill afford for these "improvements" and such penalty as there may be would seem to fall on us.

(8). *Unnecessary waste of time, labour and stationery in Public Works Department offices.*—It is a fact that we have printed standard plans and estimates sanctioned for practically every class of buildings, station-house and quarters which we require, including details like a latrine. Speaking as an outsider I am unable to see what possible practical purpose can be served by the preparation of the elaborate plans and estimates technically known as stage II for standard plan buildings. Even if we want a latrine built by itself up comes a plan, beautifully drawn on tracing cloth and signed by various officials which is merely a replica of our printed standard plan designs. I can instance a case where at the police quarter-guard in the Raipur lines, small spaces had been left between the rafters and battens at the top of the wall. Through these small spaces sparrows intruded and conducted Zeppelin raids on the police arms and stores and we wanted these spaces filled up. The actual cost of the work was Rs. 26 and the requisition involved the preparation of a beautiful plan on tracing cloth showing the whole building, with illustrative details of the rafters and battens and the spaces to be filled up. This elaborate procedure is followed in every single instance. I give another example. In the same lines at Raipur we have a block of 26 single constables' quarters in two sets of 13 back to back. We wanted a small window $3\frac{1}{2}' \times 2\frac{1}{2}'$ opened in each quarter. For this work we received a tracing sheet plan showing the whole block in plan and elevation with the proposed windows shown neatly in red ink in every one of the 26 precisely similar quarters, the measurements being neatly marked for each one of the separate 26 windows. The cumulative waste of this sort of thing must be considerable.

(9). *Inadequacy of supervision.*—It seems to me that the class of subordinate staff which the Public Works Department employs, perhaps has to employ, requires a very considerable amount of strict supervision to ensure work being carried out correctly, to avoid waste and to control generally the outlay. I am inclined to doubt whether the supervision is in fact sufficiently exercised. Whether this is due to insufficiency of superior staff or to some other reason I cannot say, but I would instance the following cases which would seem to illustrate lack of supervision.

(a). Hingna station-house and quarters in the Nagpur district built in 1911-14. Cracks showed themselves in the walls of the station-house and quarters, the ceiling boarding was badly done, and the plastering and pointing was not up to specification. The reasons of these defects, which were put right by the Public Works Department, were the use of inferior mortar and unseasoned wood. I was told that the Public Works Department sub-divisional officer had been censured.

(b). Rupjbar station-house and quarters in the Bala-ghat district built in 1912-14. The stone-flagging was

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badly done, the ground not being properly rammed, inferior bricks used, tiles not laid properly; rafters $1\frac{1}{2}$ " to 2" in diameter instead of $2\frac{1}{2}$ " according to specification, the wood used also being inferior. The Public Works Department removed the defects, but pointed out that $1\frac{1}{2}$ " to 2" rafters were quite strong enough. If this be so, it is not clear why a $2\frac{1}{2}$ " diameter was specified.

(c). Sihawa station-house in the Raipur district built in 1913-14. Soon after the building had been completed it had to be re-roofed and funds provided from the minor works grant because the tiles used were so inferior that they were useless.

(10). *Self-contained administration.*—The Public Works Department stands alone among all the departments of government in having a Public Works Department officer in the dual capacity of Chief Engineer and Secretary to Government. It is impossible for me as an outsider to say how far this may be practically necessitated by the work of the Department but it would not *prima facie* seem to be a sufficient answer that the government is in need of expert advice. The Medical Department is perhaps even more technical than the Public Works, but while the Inspector-General of Civil Hospitals is naturally the government's expert adviser in technical medical matters, he is not a Secretary for the department nor have I heard it suggested that his not being so has created any difficulty or led to any inconvenience in the administration of the department. The same may be said of the Forest Department and it is not clear to me why this cannot hold good in the case of the Public Works Department, and I believe that if it could be introduced it would help the Department considerably in their dealings with other departments. At present there is a feeling, which seems to me not without

a certain amount of excuse and justification, that one cannot get past or outside the Public Works Department and that no independent outside opinion or judgment is obtainable on ordinary matters connected with the Department. It is true that it is open to a head of a department in the event of disagreement with any other head of a department to refer the matter to his own administrative Secretary and the Police Department could therefore refer to the Chief Secretary. But this would be making a great deal of what are nearly always in themselves and intrinsically comparatively petty matters, and speaking for the Police Department I can say that this course is not in practice resorted to. In fact I can only find one case on record in which the Inspector-General carried the matter beyond the Public Works Department. Generally speaking, I am inclined to think that if it could be found possible to appoint a Secretary from outside the Public Works Department the Department would gain appreciably from an improvement in its relations with other departments.

1,040. In making the above remarks I have ventured to include one or two suggestions as to the possible line of improvement but generally speaking it seems to me that such suggestions are beyond my province. Some of my remarks will perhaps be admitted, at any rate partially by officers of the Public Works Department themselves, and if so and to such extent as this may be the case, it seems to me that any suggestion for alteration or amendment can obviously come with the greatest force and with informed knowledge from within the Department itself. I am not in a position to say what difficulties, technical or other, may stand in the way of introducing changes or what may be the best way to give effect to any changes which may be considered advisable.

The HON'BLE MR. R. C. H. MOSS-KING called and examined.

1,041. (*President.*) The witness stated that he was the Inspector General of Police in the Central Provinces and that he had held that appointment since September 1914.

1,042. The police buildings in the Central Provinces were constructed and repaired under three different systems—

- (a) by the Police Department itself,
- (b) by the divisional local fund, and
- (c) by the Public Works Department.

Police buildings at 116 places were maintained by the divisional local fund. He was not aware, for purposes of comparison, how many buildings were maintained by the Public Works Department and Police Department respectively. The construction of police buildings by the Police Department was decidedly economical and the work was probably efficient, but he was doubtful whether this was the case in regard to maintenance and repairs. He was not able to say whether the sum spent on annual repairs to police buildings was higher than what it would have been if the Public Works Department had undertaken the construction work, i.e., whether the work turned out by the Police Department was as durable as that turned out by the Public Works Department.

1,043. Departmental construction was as a rule unpopular with police officers. Viewed in the light of the general interests of government, he considered that it was an unsuitable system as it added very considerably to the work of the police owing to the fact that they had no technical knowledge to aid them. Though it might be economical, he did not think it was a system which should be extended to any substantial extent. In Nagpur it was interfering seriously with police work, because in that district the Police Department constructed all police buildings costing less than Rs. 2,500 and undertook their maintenance also. This was a special experiment started in 1907 which had been in force ever since. His personal experience of this experiment was that though the actual construction and repair work had generally been well done it had involved a tremendous amount of office work and had distracted the attention

of the police from their ordinary work. Hence he considered that although it might be economical, the system caused too much interference with the legitimate duties of the police to render it desirable, and he was of opinion that the experiment, although it had been in force since 1907 in the Nagpur district, should now be abandoned as placing too heavy a burden on the force.

1,044. Construction and maintenance of buildings by the Police Department had been found to be fairly economical as far as district headquarters were concerned, but he was doubtful whether this was the case with police buildings in outlying places. The Public Works Department would naturally prefer to make over to the Police Department police buildings in outlying places, and the interests of the two departments conflicted to that extent. In spite of the fact that it had been found economical for the Police Department to construct and maintain its own buildings in district headquarters, he would prefer that all police buildings should be taken over by the Public Works Department, as the advantages to be gained by relieving the police were greater in his opinion than any disadvantages which might be suffered in other ways. He had no objection, however, to the Police Department taking over the annual repairs to police buildings in such outlying places as were not accessible to the Public Works Department.

1,045. As the system of having a divisional local fund engineer had been in force only since 1915, he was not in a position to express an opinion as to the efficiency of that officer. He complained, however, that this system had proved expensive as $11\frac{1}{2}$ per cent. had to be paid by the Police Department for establishment charges which cut down the police budget to that extent. Under the Public Works Department system his department was not charged for supervision, and hence work done by the local fund for the Police Department had involved an extra charge of $11\frac{1}{2}$ per cent. over the cost of similar work done for the latter by the Public Works Department. This might not be an extra expense to government as a whole, but it reduced the amount available in the Police Department budget. If, however, provision were made for this charge in the police

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budget he had no objection to raise to the divisional local fund engineer system on the score of expense.

1,046. The procedure of obtaining administrative sanction to major works, which he had referred to in his written evidence, was suitable and he had no criticisms to make in regard to it. He did not think that the contention of the Public Works Department that a great deal of trouble was caused them by the fact that heads of departments frequently changed their ideas after sanction had been obtained applied to the Police Department, as nearly all works for that department were built on standard plans, the only work he recollected which was not covered by a standard plan being a *kotwali*.

1,047. In order to simplify procedure and to avoid delay after the Inspector General of Police had sanctioned the Executive Engineer's plan and estimate, he suggested that the minor works standard should be raised from Rs. 5,000 to Rs. 10,000. Major works took twice as long to commence as minor works and the Inspector General had to think about them some eighteen months or two years prior to the time of their actual construction. It was necessary for that officer to consider in February 1917 what works he would require in 1918-19 and to submit draft proposals in May 1917. He did not ask for administrative sanction to a major work until he had put it on to his "A" programme, and the delay he complained of was due to the trouble involved in getting such a major work definitely and specifically included in the Public Works Department budget. If the limit for a minor work were raised as he suggested, he would himself be competent to sanction a considerable proportion of the works at present classed as major works.

1,048. It had been his experience that, under the present system, a certain amount of waste of time occurred on works in progress at the beginning of the working season. This was possibly due to Executive Engineers wanting to know their precise allotments before they proceeded with their works. There was therefore, a distinct hiatus at the commencement of each new financial year. He based this statement on information gathered from his progress reports which showed the expenditure on each work and which were sent to him quarterly by the Public Works Department. His complaint against the Public Works Department budget system was that it resulted in surrenders and lapses of unexpended balances at the end of the year, and, as the Police Department never got anything extra to compensate for these lapses, he considered that they suffered loss in consequence.

1,049. The money available for public works was granted annually as a specific sum and lapses in one year's budget were not re-granted in the next, thus resulting in the grant for new works in the latter year being decreased. These lapses were not taken into account in settling the police budget, and hence the police programme of work was delayed by the loss of time involved in this procedure, and he recommended that the same amount of money should be allotted to his department every year. The advantage of this proposal would be that he would have the money for certain of his police works nine months earlier than he now received it.

1,050. When repairs were carried out by the Public Works Department for the Police Department, the latter were given no information as to the sums that were spent on each building. If this information were not withheld, and the Police Department knew the amount available for expenditure on repairs to their buildings, they would be in a position to suggest the various repairs that should be carried out. The distinction in the Public Works Department Code in connection with repairs was also, he remarked, a stumbling block at present. Under the Code rules the Public Works Department could not allow the Police Department to replace, for instance, a broken cement floor by a flagged floor on the ground that the latter was an original work and not a repair as defined by the Code. The distinction between original work and repairs in the Code should be removed and the Police Department should be given a freer hand in judging what constituted repair work and

what original work. Under the present ruling his department were unable to repair police lines of antiquated pattern and to bring them up to modern requirements unless they prepared a special estimate.

1,051. He criticised the present Public Works Department plans for small petty works as being too elaborate and suggested that a saving might be effected by drawing up simpler plans.

1,052. For the good of the general administration and of the Public Works Department itself, he was of opinion that the Chief Engineer should not be also Secretary to Government in the Public Works Department as this organization had tended to detach the Public Works Department from the other branches of the administration, and make its interests too separate and isolated. If this organization were changed he thought there would be an improvement in mutual relations of the departments and that the feeling which undoubtedly existed at present that it was not possible to get past or outside the Public Works Department would disappear. This feeling reacted both on the officers of the Public Works Department and on those of other departments, whose point of view was not sufficiently understood by the former. In regard to the Police Department in particular there was a tendency on the part of the Public Works Department not to give sufficient consideration to the wishes of that department in regard to building construction work.

1,053. (*Sir Noel Kershaw*). He explained that the Malhona station-house referred to in his written evidence was not an exceptional station-house, but was a good building for the Police Department to have constructed. The Police Department were not allowed to construct expensive buildings like the Nagpur Quarter Guard, except as an imprest holder for the Public Works Department.

1,054. (*Mr. Mackenzie*). The Secretary to Government in the Public Works Department should, he thought, be recruited from outside the Department, as an administrative Secretary and should administer the Department in the same way as was at present the case with other branches of the administration. He was not aware that the tendency now-a-days was in the direction of making the heads of professional departments the administrators of their departments even though they were men of the same profession themselves and he did not think this was the case elsewhere in the Central Provinces. He met the contention that the port trusts and improvement trusts had engineers at their head by explaining that under his scheme the Chief Engineer would still be at the head of the Public Works Department although that officer would not be the administrative head. His proposal contemplated a senior officer in the post of administrative Secretary, whose duties would be to deal with all references which required the orders of the local Administration.

1,055. (*Rai Bahadur Ganga Ram*). When the Public Works Department constructed minor works for the Police Department they did not charge the latter 11½ per cent. for establishment, as was the case when the construction of police buildings was undertaken by the divisional local fund. Nor did the Public Works Department make over to his department any money for establishment charges when they transferred minor works for execution by the Police Department. This he explained was due to the fact that minor works were allowed for in the Public Works Department budget. The funds for the building and repair work done in the Nagpur district by the Police Department since 1907 were the funds included in the police budget for petty construction and repairs.

1,056. Police departmental construction of buildings in the Nagpur district had been found to be economical in initial construction. He did not think the police in outlying places impressed labour; they paid for every man whom they employed at the market rate. The reason why contractors took work from the police at a lower rate than from the Public Works Department was because, under the former agency, they did not come into contact with Public Works Department lower

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subordinates. He had never heard of contractors having received assistance from the police in impressing labour.

1,057. (*Mr. Cobb.*) In the case of buildings which they maintained, the Police Department decided for themselves which should be repaired and had an entirely free hand in the matter subject to money provision; but if the buildings in question were not on the Police Department's books, the Public Works Department arranged for repairs and the Police Department had no voice in the matter at all, and although they could draw the attention of the Public Works Department to any requirements which they noticed, it rested with the latter to carry out the work thus indicated or not. It would be more convenient to allow the decision to rest with the Police Department in these latter cases also.

1,058. In connection with his proposal that the Chief Engineer and Secretary to Government in the Public Works Department should not be one and the same person, he admitted that more outside criticism of the Department, which was desirable from an administrative point of view, was secured by the present system, but stated there was a prevalent idea that criticism was not encouraged, and if given, was ineffective. It was a matter of detail whether the Secretary for the Public Works Department should be attached to some other department of the administration or not, depending merely on the amount of administrative work required. Possibly the Public Works Department was too large to be attached to another. Under his scheme the Chief Engineer would still be the technical adviser to the administration.

1,059. (*Rai Bahadur Ganga Ram.*) He expressed his inability to give an opinion as to whether the specifications for police buildings were unnecessarily high or not, and also whether, if high, they could be reduced.

P. S. PATUCK, Esq., I.C.S., Deputy Commissioner, Narsinghpur.

Written Statement.

1,064. (I.) Economy and suitability of methods of execution of public works, and (II.) Encouragement of other agency.—The ordinary work of the Public Works Department in a district might be divided into (1) maintenance and repairs of (a) government buildings and (b) roads, and (2) construction of new (a) buildings and (b) roads. The work of maintenance and repairs of buildings or roads does not require great technical knowledge or skill, and I am of opinion that this work should be done by a district engineer, with the necessary subordinate establishment, under the control of the district council and the Deputy Commissioner. The engineer employed must have sufficient qualifications to do this work without much supervision regarding technical details. New buildings are not constructed in districts every year, excepting small schools or cattle pounds, and I am of opinion that all government buildings costing under Rs. 30,000, should be constructed under the district engineer. He should be considered competent to prepare plans and specifications and estimates for such buildings and able to take the responsibility for their construction. No technical sanction of a higher authority should be necessary for such buildings. For buildings costing more than Rs. 30,000 and for new roads technical sanction of a higher authority might be required.

(2.) At present some roads and government buildings in the district are maintained by the district council, and others by the Public Works Department. Owing to this division, two separate establishments of subordinates have to be maintained, and these establishments are supposed to be supervised by engineers who are in charge of more than one district. For example, in the Narsinghpur district, the sub-divisional officer and his establishment costs about Rs. 5,000 a year, and the district council spends about the same amount on its local establishment. In addition, there is the Executive Engineer and his establishment, to supervise the sub-divisional officer, and there is a divisional local fund engineer to supervise the district council establishment.

1,060. He did not think that the police buildings constructed by the Public Works Department were of too *pucca* a nature as the police needed durable buildings in view of the fact that police circles did not change very rapidly. He had never compared the specifications for police buildings in the Central Provinces with those of another province.

1,061. (*Mr. Durie.*) In his written evidence he had recorded that the police station-house at Malhona was built by the Police Department at a cost of only Rs. 2,000 against a Public Works Department estimate for a similar building of Rs. 3,700. He explained that he did not mean to convey the impression that the Police Department could always do such work cheaper than the Public Works Department, but that in this particular case a building had been constructed by the former at a cost which was lower than the estimate for a similar building prepared by the latter. This particular station-house was of the same class as those constructed by the Public Works Department in the Jubbulpore Division, the rate for one of which he had taken into consideration.

1,062. He had not had any personal experience of work slackening off in May and June, as he usually ceased touring in April, and hence had little opportunity of inspecting works actually under construction.

1,063. The surrenders of funds on account of the Palari and Nimbola station-houses in the Raipur district, mentioned in his written evidence, were due to the sites for these buildings not having been settled. Funds were not allotted till sites had been finally decided upon. The Deputy Commissioner was responsible for fixing the site.

The cost to the local bodies in the Narsinghpur district of the divisional local fund engineer and his establishment is about Rs. 2,500, and the portion of the cost of the Executive Engineer and his establishment, which could be considered as debitable to Narsinghpur district, would scarcely be under Rs. 6,000. Thus, excluding the cost of direction, the establishment for works in this district costs about Rs. 18,500. The amount spent by the Public Works Department on works in 1915-16 was about Rs. 70,000, and by the district council and local bodies about Rs. 40,000, and thus the establishment takes up about 16 per cent. of the cost. As most of these works are given out on contract and there is generally some separate establishment included in the estimates 16 per cent. represents practically the supervision charges and this seems to me unduly high. If the two subordinate establishments are amalgamated, it is easy to get a qualified engineer and a sufficient staff to do all the work in the district at a cost of about 10 per cent. or less on the total amount of work done in the district.

(3.) For works costing over Rs. 30,000 the check on the district engineers' work will be exercised by Superintending Engineers. I think two such engineers should suffice for this province for this work and general supervision, as works costing over Rs. 30,000 are not very numerous. At present, all original works over Rs. 2,500 require the technical sanction of the Superintending Engineers. It seems to be scarcely sound that Executive Engineers should not be trusted to prepare proper plans and estimates for works over Rs. 2,500, and that their work should require to be checked by a higher authority. From buildings built by the Public Works Department under the present rules, it could scarcely be said, that the checking of plans and estimates has prevented defects from escaping notice or that the buildings constructed are any the better for such checks.

(4.) I am of opinion that it is not so much the checking of plans and estimates that is necessary, as proper supervision of works on the spot. The qualification and character of the officer who supervises the construction of a building determine whether it is properly constructed

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or not. Under the present system, the local officer who looks after the construction is an upper or lower subordinate. The Executive Engineer visits the work only occasionally. If each district has an engineer the local supervising officer will be a better qualified and a more reliable person.

(5). The above contains suggestions regarding the ordinary routine work in a district. When important original works, like a building costing about a lakh or a costly bridge, or an extensive drainage scheme, is to be taken up, I think, tenders should be called for invariably from engineering firms or contractors. It will not be easy at first to induce firms to come over to the province for taking up works, but I scarcely think with some encouragement it should be difficult to get reliable engineer contractors to apply for works costing say about a lakh. With a profit of about 10 per cent., if the work could be finished in about six months, there is sufficient inducement to engineers to tender for such works. I think, as a rule, the engineer who makes out the plans and specifications of a work should not be the engineer who takes the contract for constructing the work. The former should be the supervising officer, and the actual construction should be by a firm unconnected with the person whose plans and specifications are accepted. For the present, till reliable firms of consulting engineers increase in number, it would be necessary for government to keep a permanent staff to prepare plans and specifications for original works, and to supervise the actual construction of these works, but I think the ultimate aim ought to be to get such plans, etc., prepared by consulting engineers and pay them some commission for the preparation of the projects and also for supervision during actual construction.

(6). In Wardha the survey was made and the plans and specifications for a surface drainage scheme were prepared by a private firm of engineers, and the construction of the drainage was also entrusted to the same firm, as far as I remember, on the following conditions. The cost of the scheme was calculated at the Public Works Department rates and it was agreed that the firm of engineers should receive 17 per cent. of the actual cost of the work done as their commission and about 25 per cent. on the savings on the estimate. I do not consider that such an arrangement is either economical or sound. I think the firm should have been kept in supervising charge only and tenders should have been invited for rates at which contractors would agree to do the work. As the project was estimated to cost over Rs. 1½ lakhs, I scarcely think there should have been much difficulty in getting tenders.

(7). As India contains numerous districts which are not fully developed, there is constantly a demand for surveys for new roads. I think that if this work could not be done by district engineers, temporary engineers and surveyors should be appointed for this work unless there is sufficient work to justify the employment of a permanent staff.

1,065. (III.) Changes in organization, and (V.) Decentralization.—The suggestions made above require the reorganization of the whole Public Works Department establishment. The idea is to keep a permanent establishment for the routine work of maintenance and repairs to roads and buildings, and original works of small value under the local bodies, and the district officer, and to make use of private engineers for all original works, the cost of which is sufficiently high to leave such a margin of profit as would induce private engineers to tender for such works. To supervise these works, and also the work of the district engineers, two or more Superintending Engineers should be kept by government

who, in addition, till firms of consulting engineers become more numerous, will prepare plans and specifications for all large works. From the Type Budget appended to Book Circular, Part III, No. 27, it appears that 21 per cent. of the cost of public works is spent on establishment. As in addition, some establishment is included in the estimates of most works and as the estimates must include the contractor's profit, which could scarcely be under 10 per cent., it seems to me that the present system of constructing public works is rather an expensive one, and the method suggested above ought to result in some decrease in cost.

(2). The question of the pay of the district and Superintending Engineers, the number of such engineers required for different districts, whether they should form a joint graded service, or not, these are questions of detail which could only be settled after considering the expenditure on public works in different districts. In my opinion, the district must be considered a large enough area to justify the employment of a responsible and a fully-qualified engineer, and the present system of having subordinates in charge of works in a district, subject to supervision by an Executive Engineer in charge of a division, should be done away with. There ought to be a complete decentralization of powers, and the engineer in a district should be given more responsibility and powers than at present. The number of returns and reports should be cut down and check and supervision and audit should be local. I am informed that a sub-divisional officer has to send copies of his cash book fortnightly, eighteen returns or reports monthly, three quarterly, four half-yearly and seventy-five yearly, and thus a great deal of his time must be spent in office instead of on works.

(3). Another matter which seems to me to require alteration is the present practice of having a practically separate organization for doing works, outside the control of the local bodies or the government departments which finance the works. For example, the water-works in all municipalities are financed by municipal committees, but they have practically no voice in the management. The establishment is not under their control, and the committees have no power to prevent waste. The subordinates in charge are not under their orders, and as their work is supervised by officers who are generally not on the spot, the supervision is seldom very effective. Similarly, when any government building belonging to any department is being built, the local officers of that department have no voice in the method in which work is being done, and so take little interest in the way the work is done, and if some officer ventures to point out defects, the Public Works Department officers consider it an unnecessary interference with the work. This same system has been adopted in the divisional local fund engineer scheme recently introduced. The divisional engineer and his subordinates are not under the orders or control of the district council or other local bodies which pay them and supply funds for works. All that the local bodies have to do under the present rules is to select the works, approve of the estimates, and leave the divisional engineer and his subordinates to do the works. When the work is completed, the local bodies have to give a completion certificate, and if the work is bad, beyond fining the contractor and a deal of grumbling nothing else can be done. I think the agency under which a work is done, must be subject to the control of the body that finances the work, and I think one great defect of the present divisional local fund engineer scheme, is that the engineer and his subordinates are not under the control of the local bodies which finance the scheme and the works.

MR. P. S. PATUCK called and examined.

1,066. (President.) The witness stated that he was a Deputy Commissioner and had 17 years' service.

1,067. In his written evidence he had put forward a scheme for the reorganization of the Public Works Department under which all except very large buildings and all roads were to be made over to a district engineer-

ing staff under the control of both the district council and the Deputy Commissioner. He explained that his intention was that in regard to buildings belonging to government the engineer should work under the Deputy Commissioner, who had at present a certain amount of control over the district council. The service contem-

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plated in his scheme was practically a local board service controlled by the local bodies, but with a voice in the management of government buildings reserved for the Deputy Commissioner ; in other words, so far as the staff undertook government works it would receive orders from the Deputy Commissioner, and so far as it undertook district council or municipal works it would work under the orders of the local bodies. This system, he considered, would work satisfactorily, which view was supported by the fact that at present the divisional local fund engineer in his division, though paid by the district councils, took instructions from the Deputy Commissioners and local bodies of five districts and was under the control of the Commissioner, though the latter officer never gave orders to him direct regarding works.

1,068. The appointment and dismissal of the divisional local fund engineer rested with the Commissioner, but the former officer received requisitions for work from both the local bodies and, in connection with government work, from the Deputy Commissioner, or other government officers: He was of opinion that the power of the appointment and dismissal of the district engineers suggested in his scheme should be vested in the Deputy Commissioner, who would also give him government work to carry out, while local bodies might requisition him for whatever work of their own they wanted done. Local bodies should have a voice in the construction and maintenance of all works which they financed. This system, he thought, would work better than the present divisional local fund engineering scheme, and the dual control over the district engineer would cause no inconvenience. At present some government works were managed by the district boards' establishment, and some by the government sub-divisional establishment.

1,069. A scheme on somewhat similar lines to his own, but with the difference that the control would lie entirely with the district board, who would employ its own engineering staff to do all its own works, and also to undertake the maintenance and construction of certain government and municipal works as contribution work, was put to him and he remarked that this was practically what his scheme amounted to, but added that the only question that would still have to be considered was the appointment of some central controlling authority when there were several local bodies in a district, as if the interests of local bodies were not coincident there would possibly be some friction. This central authority would regulate such questions as the relative attention to be given by the engineer to municipal work, district council work and government work. In connection with this regulation of work, he proposed to give a certain amount of power to the Deputy Commissioner as the central authority, to interfere when he found that there was friction. Payment of salary, etc., might, however, be made by the district council. With the Deputy Commissioner represented on the district council there should not, he considered, be much possibility of friction. As between a government service for government works in each district managed by the Deputy Commissioner, but available for the works of local bodies in the district on application to that officer, and a wholly district council service, he preferred an intermediate course as he did not desire his district engineer to be wholly under the Deputy Commissioner, or the Deputy Commissioner absolutely without a voice in respect to the works in his district, and added that he did not think that the engineer would fall between two stools if the Deputy Commissioner acted in a reasonable manner.

1,070. In regard to the criticism that the public works expenditure in some of the districts in the Central Provinces might not be large enough to justify the entertainment of a district engineer of the competency he desired, as for example in Narsinghpur where this expenditure was only Rs. 1,10,000, he explained that for such a district as Narsinghpur a competent engineer of the status of a sub-engineer could be obtained on a salary of Rs. 300—500, but for the larger districts a more efficient man on a higher salary could be secured. In respect to subordinate establishment he emphasised the fact that at present there was in each district a dual

establishment consisting of two ordinary sub-divisional officers drawing about Rs. 150 a month each and four sub-overseers, two employed by the Public Works and two employed by the district council. He did not think that there was enough work in his district for four sub-overseers. If the public works and district council staffs were reduced by amalgamation, he considered that it would be possible to employ an engineer on Rs. 300—500 to supervise the work in place of the present sub-divisional officers, and the work of these engineers could be supervised by Superintending Engineers, each in charge of several districts, on about Rs. 600. He expressed himself as unable to give an estimate of the amount of work each Superintending Engineer should have, and in regard to his own district remarked that there was not sufficient work there at present to require extra supervision, but he thought that possibly in future there might be works important enough to require more supervision than the ordinary district engineer could give.

1,071. A district engineer on Rs. 300—500, an overseer on about Rs. 70 or Rs. 80, two sub-overseers on about Rs. 50 or 60 each, with some clerical establishment such as draftsmen and the like, was the district engineering establishment which he proposed. Extra work in any particular district could be met by engaging a separate works establishment. He calculated that the cost of such an establishment would work up to a percentage on the works expenditure of something less than 10 per cent. The engineer he proposed ought to be quite competent to carry out the ordinary routine work of a district, but if a large building such as a hospital were to be constructed the plans and estimates prepared by this engineer would have to be checked by some supervising authority. Rules might be laid down for the control of money payments, which would be verified by members of the district council and by the Deputy Commissioner's staff. If the engineering staff were put on to government work, such as police buildings, the District Superintendent of Police would see that the work was carried out properly. His whole object in giving the control of this staff to the Deputy Commissioner was to avoid friction.

1,072. Large works costing about Rs. 30,000 might be entrusted to private agency. If such works were advertised he thought that competent firms of engineers would tender for them. Though there were no engineering firms in Nagpur itself, he was of opinion that firms in Bombay and Calcutta might possibly find it worth their while to take up such works, and suggested giving the scheme a trial. It was pointed out to him that such a scheme had been tried and failed ; he remarked that he was not aware that the advertisements circulated included places outside Nagpur. He added, however, that his suggestion was a mere idea, and that it seemed to him that too many engineers at present desired to take up permanent service rather than to set up on their own account. A private firm should not be allowed to start the construction of any work unless there was a supervising agency present and government work should be supervised by a government agency.

1,073. In support of his contention that other branches of the administration should have more voice in the methods by which works were executed for them by the Public Works Department, he cited as an instance the case of a civil court, which was being built at Narsinghpur, and added that he did not think the District Judge took any interest in the work and was, so far as its execution was concerned, practically a nonentity. The construction was left entirely to the sub-divisional officer and engineer. The District Judge should be at liberty to see that bad work was not done. He further cited the case of a hospital recently built at Narsinghpur under the divisional local fund engineer and remarked that the Civil Surgeon had a great deal of trouble to get the engineer to comply with his wishes. He also complained that under the present system the engineer in charge of a work was not usually on the spot, with the result that the work was left to a subordinate, and the engineer very seldom knew what materials were actually being used on the work.

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1,074. He was of opinion that district councils, at the present time, were in a sufficiently advanced stage of development to justify government in making over to them buildings for maintenance, together with funds for the purpose. In order to secure efficiency of work the necessary government control over the district staff should be vested in the Deputy Commissioner, in so far as government buildings were concerned. If this officer found that a district engineer had failed to spend the sums of money provided for the repair of government buildings efficiently, he would exercise his control over this engineer by punishing or dismissing him.

1,075. (*Rai Bahadur Ganga Ram*.) Control by an officer outside the district staff was not required at present as far as repairs and minor works were concerned. The engineer appointed to each district should be qualified enough to be depended upon to check estimates, and no control should be necessary over that officer in this respect. A competent engineer on a salary of Rs. 300 to Rs. 500 ought to be quite sufficient for the minor works and repairs in a district.

1,076. As most buildings in his district were built on black cotton soil it had generally been the experience that the walls cracked in the first year. He did not know whether this was due to bad materials, or bad workmanship or to defects in the plans, but he was of opinion that, if the engineer had more opportunity of looking after the work himself, there would be much less chance of bad work or bad materials being passed. The responsibility for this, under the present system, seemed to him to be divided. As Deputy Commissioner, he would trust the engineer entirely, provided that officer personally looked after the works.

1,077. (*Sir Noel Kershaw*.) There were, in the Central Provinces, twenty-two districts that would have to be provided with a district engineer under his scheme. He had considered only the circumstances of his own district in which he thought that the cost of the establishment required under his scheme would be much less than it was at present. The subordinate staff would be one overseer and two sub-overseers instead of as at present two sub-divisional supervisors and four sub-overseers.

J. M. VACHA, Esq., Executive Engineer, Central Provinces.

Written Statement.

1,082. (1.) **Economy and suitability of methods of execution of public works.**—The methods at present adopted for the execution of civil works are neither economical, nor efficient. They were adopted at a time when the country was very backward, and were most probably best suited to the conditions prevailing over fifty years ago. With the rapid strides that the country has made, especially during the last twenty years, this scientific department instead of leading, or even keeping pace with the times, has lagged behind. No doubt engineers have done a lot for India, even during the last twenty years, but, considering the numerous resources and the vast scope at their command, neither much ingenuity nor originality appears to have been shown, nor can the works be said to have been executed economically by the adoption of the best methods and means. This can be attributed in a great measure to the obsolete system of the Department tending, in such matters as accounts, correspondence, petty works and repairs, to take up an amount of an engineer's time out of all proportion to the magnitude and importance of the work in hand.

(2.) An Executive Engineer, worth the name, is wasted in an ordinary division as at present worked. In an average division considerably over half the expenditure is on the maintenance of roads and buildings, and on the construction of petty works requiring little or no engineering skill. The Executive Engineer has to keep up a heavy correspondence, scrutinise, check and control expenditure, see to the proper and timely compilation of accounts, look to the maintenance of a large number of buildings scattered all over the division and about a

The Superintending Engineer would be in general charge according to the amount of work, of six, seven or eight districts and would be an inspecting officer instead of an executive officer. He was not able to say how many of the present Executive Engineers could be dispensed with, as this required some knowledge of the amount of work in districts other than his own, but surmised that at the beginning the number of these officers might safely be reduced to half.

1,078. In respect to the control which the Deputy Commissioners could exercise over the district engineers in cases of unsatisfactory work, he admitted that, at present, this control was very slight, but added that under his scheme government would not be in a worse position, than it was at present. This control would practically amount only to either punishing or dismissing the engineer.

1,079. (*Mr. Durie*.) He thought any engineer who had passed his examinations ought to be competent to prepare specifications and estimates for a building costing Rs. 30,000, even if he was employed on a salary of only Rs. 400 a month.

1,080. He admitted that there had been cases where suggestions made by other departments to the Public Works Department, in connection with works executed for the former by the latter, had been adopted, as in the case of the Jubbulpore Normal School, in regard to which he thought the Public Works Department had adopted suggestions made by the principal of that institution. But he added that there had also been instances where the reverse had been the case and where suggestions made to the Public Works Department had been resented. The acceptance of suggestions depended considerably on the personality of the officer in charge of the work.

1,081. (*Sir Noel Kershaw*.) He had no practical experience of the system, obtaining in England, and did not know that in England many surveyors drawing less than Rs. 400 a month were entrusted absolutely with the designing and execution of works which cost considerably more than Rs. 30,000. He had heard of a large building costing over Rs. 80,000 designed and constructed by a divisional local fund engineer in India.

thousand miles of roads, besides preparing plans and estimates for a number of new works, and see to their prompt and economical execution. It is not to be wondered at if, under such circumstances, he is obliged to leave a good deal of important work to his meagrely paid sub-divisional officer.

(3.) The Executive Engineer gets, probably, a pay of Rs. 1,000 and more, while some of his sub-divisional officers are mere sub-overseers drawing a pay of Rs. 50 to Rs. 60 per month. No business firm would ever think of having a manager on a salary of Rs. 1,000 per month and his next assistant, who spends Rs. 1,50,000 a year, keeping his own accounts and cash book and drawing his own cheques, on a paltry pittance of Rs. 60 per month. Seeing the absurdity of this position the local Administration now calls a sub-overseer, who is placed in charge of a sub-division, an overseer, 2nd grade, temporary. It does not, however, alter the man, call him by whatever name you like. The case only illustrates the methods usually adopted in the Department to remedy crying absurdities.

(4.) There are so many measures devised both in the Public Works Department Code and in the innumerable circulars issued by the local Administration, to check the irregularities and abuses of a bad and faulty system, that no Executive Engineer can possibly have the time and energy to exercise the supervision and control called into requisition by an initially bad system, which is rendered worse by indifferent administration.

(5.) The methods and system now in use are practically the same as prevailed when the means of communication in India were limited, and civil works to be executed were few, with little or no facilities for their execution.

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Circumstances have now changed, but still the same obsolete methods are followed. The same backward class of people are mostly kept up as contractors, and even in some cases works are carried out departmentally. In India, the European method of inviting tenders from contractors, who submit their own designs and estimates for the works, is mostly unknown. This is not due, however, to any inherent defect in India, but to the want of demand for the class of contractors. All the public works in India, even the petty ones, are carried out on the designs and estimates prepared by the Public Works Department. A contractor is mostly an intermediary between the workers and engineers, to relieve the latter of the necessity of making direct cash payments to workers. He acts merely as an engineer's money distributor, and understands little about the work, except to purchase materials and to some extent to get together the necessary skilled and unskilled labour.

1,083. (II.) **Encouragement of other agency.**—In big towns, like Bombay and Calcutta, many private people have to undertake large constructional works. They follow mostly the government method, and get designs prepared by an engineer and give the work out to contractors only for construction. But there are now coming forward a class of contractors who submit their own designs and estimates and contract for the work, a much more satisfactory system, as the contracting parties know what they are in for and do not care to be saddled with excesses over estimates prepared by others. In a place like Bombay, where thirty years ago private engineers hardly numbered two, they are now to be counted by the dozen, and all in good practice. What the practice is today in Bombay and Calcutta will be the practice in a large number of towns in India in a few years more. It is the method of work of the Public Works Department which, instead of helping the progress and development of the country, generally tends to retard the same by its adherence to obsolete methods.

(2) It is often remarked that these obsolete methods are followed because there are none better available, and there is no help but to follow them. But no systematic efforts have ever been made to help the Department out of these methods, by the spread of technical education, gradual reorganization by decentralization, and doing away with the class of low-paid subordinates. It is the present Public Works Department methods which discourage private enterprise, and no patch-work modification would mend matters. It is the present system which has kept men with engineering qualifications, energy and enterprise, from taking to contracting, and has suppressed the growth of a decent class of contractors. Modifying the system on the lines briefly outlined below with well-paid engineers and assistants, who work as advisers and inspectors, a good class of self-respecting contractors will arise and with the mutual superiority of both the classes the present great wastage by leakage through low-paid supervising staff, which is the prevailing evil of the existing system, will be mostly checked and the works will be executed promptly, economically and efficiently. The system will encourage both the engineer officers and the contractors to do their best.

(3) The people of India are accustomed to look to government for example and guidance. Engineering plays no mean part in the industrial development of a country. The government should, therefore, institute a system of executing civil works suited to the present time, and the industrial development of the country. The existing system was suited to the old times when the whole idea was to secure some plain buildings to hold offices in and to open out the country with cart roads. The start having been well made, the requirements are no longer rudimentary, but demand development on more advanced lines.

(4) Ordinary civil buildings works, on standard plans, or below certain fixed amounts, say Rs. 25,000, will be entrusted to the district board or some such local body. Similarly, all original road works under a certain limit, say Rs. 50,000, will be executed by the district board. All important buildings and roads constructed by local bodies from the Public Works Department funds will be

inspected by the Public Works Department officers, who will countersign the completion certificates. Only roads connecting the headquarters of districts will be under the Public Works Department for maintenance. These roads will not be maintained on the present system, but will also be given out in whole lengths for maintenance to contractors, who will be paid quarterly for their proper maintenance on the bills submitted to the sub-divisional officer. All the buildings and other roads will be handed over to the local bodies for maintenance, funds for the same being allotted from the Public Works Department budget.

(5) The reforms proposed do not intend to pass the unimportant works of the Public Works Department to the local bodies to be executed by them in the same inefficient and uneconomical way as at present. The local bodies will have before them the Public Works Department as a model, and with the freedom of action and greater touch with the public that they have they will be able to work on efficient business lines. The decentralization proposed by transferring roads, buildings and unimportant works to the local bodies will in course of time, with increased responsibilities, cultivate a spirit of public duty in the members of the local bodies. Up to now the people are too much accustomed to look to government to arrange everything for them. The materials with which the public bodies are at present required to work, and the Public Works methods they are required to follow, are no way such as to engender in the members of the public bodies the spirit of self-help and public duty.

1,084. (III.) **Changes in organization.**—All officers of the Public Works Department should be on one imperial list of the Government of India, and no officer should be kept in a province more than eight years. This will give a broader outlook to the officers of the Department, so very necessary in a profession like that of a civil engineer. It will also indirectly remedy the defects of working in a groove and at times in a clique, and tend to encourage initiative which is such a great and important factor in the economical execution of works.

(2) With the system outlined below the present class of subordinates will not be required in the Department. The technical subordinates, *viz.*, draughtsmen and estimators, required will correspondingly be of a better class and qualification. A class of *mistris*, like foremen, will again spring up efficient in their respective branches of work and will supervise the labourers of the contractors. The present sub-overseer class is an anomaly, as he is neither a *mistri* nor an engineer. There will be no place in the reformed Department for him. The present upper subordinate class will also disappear, and in its place engineers from the provincial colleges will be appointed as sub-divisional officers, holding the same status and pay as Extra Assistant Commissioners.

1,085. (IV.) **Relations with other departments and sub-branches.**—When the Department will be organized efficiently as below to meet the requirements of the time, and the works are carried out economically and expeditiously, its relations to the other departments of the Administration will naturally improve.

1,086. (V.) **Decentralization.**—As regards the practicability of improving the present Public Works Department by decentralization within the Department it may be said that the present Public Works Department methods are so much behind time and deep-rooted that no system of decentralization can remedy the inherent defects of greatly antiquated methods. Much of the decentralization work introduced in the Department of later years has not produced satisfactory results and has not tended to efficiency and economy.

(2) It is mostly due to these antiquated methods of work in the Department that the otherwise admirable provisions of the Public Works Department Code have partially failed to check abuses resulting in the uneconomical execution of works. The Public Works Department Code rules have thus naturally, to some extent, restricted or retarded the economical, efficient and prompt execution of works. It is, however, the Public Works

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Department staff, and methods adopted by them, which are found unsuited to cope with the expanded works under the present advanced circumstances. But for the restrictions wisely laid down in the Public Works Department Code, there would have been greater waste of public money.

1,087. (VI.) **Simplification of procedure.**—There is no reason why the Public Works Department should not be developed, within a reasonable time, into calling for tenders for work, the necessary data being supplied, and the contractor submitting his designs and estimates for the construction of works within the stipulated time. The contractor will submit his own bills to the Public Works Department sub-divisional officer, who may be called the Inspector of Works, and he will pass it on to the Comptroller for payment. The Public Works Department officer will have nothing to do with the accounts. All final bills will be passed by the Executive Engineer, who will forward them to the Comptroller. The work of the present Executive Engineer will thus be limited to put into shape the requirements of other departments, and call for tenders and get the work constructed according to the approved designs. He and his assistant, the Inspector, will make periodical inspections of the works in progress to see that they are executed according to the specification.

1,088. (VII.) **Education.**—It is not a little disconcerting to see that notwithstanding the universally recognised fact that India has reached a stage when the development of technical education is highly necessary, students are refused entrance in more than one engineering college in India, on the ground of insufficiency of accommodation and danger of overcrowding the profession. Considering the fact that there are very few government engineering appointments, the desire of a much larger number of students to join the civil engineering profession only shows that there is great demand for engineering education on its own merits. Not only has the government neglected the expansion of engineering institutions, so as to keep pace with the development of the country, but even the quality of education imparted is not uniformly good. It is rather invidious to make comparisons, but I had once engineers from the four colleges of India, at one and the same time, working under me on some original works, and I had no hesitation in classifying them in order of merit as under:—

(1). Roorkee, (2) Sibpur, (3) Madras and (4) Poona.

(2). From personal knowledge of the education in Roorkee and Poona, I can say that the system of education in the two colleges is so very different that I consider it a misfortune that circumstances should compel a man to join the Poona College.

(3). I have some knowledge of the English engineering education, and I can say that in the Roorkee College the Government of India have a valuable asset for the development of the civil engineering education in India. Roorkee College should be made an imperial engineering institution under the Government of India. It should be opened to those students from the whole of India who can pass the Roorkee entrance test. Similarly, the other engineering colleges in Bombay, Bengal and the Madras presidencies should be enlarged, brought up-to-date and increased in number. One, or more, new provincial colleges may be opened for the Punjab, the United Provinces and Central Provinces. Those wanting to learn engineering, who cannot, or do not, join the Roorkee College can join any of these provincial colleges. With the great expansion of the civil works in all the provinces in India during the last two decades, there has been little corresponding expansion of the engineering colleges. The engineering education should form a charge on the Public Works Department budget of the province, including the imperial grants concerned, with a fixed minimum percentage on the budget, the expenditure in any year being not lower than that of the previous year.

(4). Students should be allowed to keep such terms in different provincial colleges as they like. The professors, whose classes the students attend during a term, should take the fees. This generally encourages a professor to draw students from all over the country to his

class, by greater devotion and interest in his work. Moving about in different parts of the country is becoming general now, and at no distant date there will come a time when an Indian engineering student will be anxious to learn different branches of engineering in different colleges in India wherever the professors of the particular branches be men of more than ordinary fame. Professors in the engineering subjects should be nominated from the Public Works Department for periods of about five years.

(5). There should be an Imperial Engineering Advisory Board of Visitors for all the engineering institutions. The Board can try to bring the working of all the colleges in a line, by noting the good points in each and communicating them to others, and may also have a voice in the appointment of a proper class of professors.

(6). The present system of education needs modification, on lines which will ensure a better class of recruits for the public service, and will create a class of private practitioners and contractors, who will undoubtedly play such a great part in the industrial development of India as no member of any other learned profession can. Besides the fact of the education of the engineering colleges in India not being uniformly good, there are two main remediable reasons why the best possible candidates are not attracted at present to the engineering colleges. The first reason is the introduction of the restriction that an Indian-educated engineer can join only the provincial service, and not the imperial. The better class candidate is practically debarred from joining the engineering colleges in India as not only does the provincial engineer get two-thirds the pay of the imperial engineer, but an Indian, finding the imported engineer as a class in no way superior to him as far as his work is concerned, naturally feels it a sort of slur to be called a provincial engineer, and in a way considered inferior to the imperial engineer in status, though capable of doing equally good work, if not better. The second reason is that owing to the present faulty and antiquated methods and system of the work of the Public Works Department, there has hitherto been little scope for engineers to do independent work as private practitioners, contractors, or as engineers for contracting firms, which latter have been necessarily few. There has also been little scope for doing work for local bodies as the Public Works Department generally executes works for them also.

(7). The system of education in all government colleges is not organized on a sufficiently broad basis. After a three years' general engineering course and passing the final test, each student should specialize, for at least one year, in one or more subjects such as architecture, irrigation, railways, hydro-electric engineering, sanitary engineering, ferro-concrete engineering, mining and mineralogy, geology, etc., and the diploma should be granted after an engineer has specialized in at least one of these subjects. An important omission in the curriculum of all engineering colleges is architectural engineering. An engineering debating society should also be a compulsory adjunct in all the colleges, as the passed students to be successful business men should be able to place their ideas clearly, concisely and convincingly before their clientele. Many an otherwise good engineer, through want of this training, fails to utilize his abilities and attainments to the full advantage. In the debating society different engineering subjects would be often discussed, after visits to the works under construction in the neighbourhood. The students would be required afterwards to summarise the discussion and state clearly the opinion formed by them. There should be an examination at the end of each quarter, and these quarterly examination marks should be added to the final examination marks to ascertain the place of a candidate according to merit. Every passed student should be allowed facilities by the principal of the college to undergo a course of practical training on any large work selected by the student with the principal's guidance and advice.

(8). From my experience of twenty-six years in the Department, my two years' training in England and six years' observation of the engineering works in Europe, I can safely assert that India can easily produce its own

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engineers, more so than it can its own lawyers, and these too of a class who can hold their own against the engineers of any other country in the world. The few Indian-trained engineers, who have been in the public service, though often not enjoying the advantages and opportunities of the imported engineers, and working under certain disadvantages and disabilities, have fairly succeeded in holding their own with their confrères. From actual data it is found that the percentage of officers of the Department who have risen to the higher administrative posts is greater in the case of Indian and Anglo-Indian engineers than that of the imported ones. When reorganized on the proper lines, the Department will require half the number of its present officers. Most of that number can, with advantage to the country, be appointed, from those educated in Indian colleges. The imported men should be the best of their class available. Nobody who has not practised his profession for at least five years should be imported. They should be graded with the Indian-appointed men, taking their position in the list according to the length of time they have worked elsewhere in the Empire. This will enable them to come out to India on good salaries. The number of imported men should be just sufficient to give a tone to the Department. An Indian-trained Assistant Engineer, before rising to the higher class, should undergo a course

of one year's training in England, being granted six months' examination leave, and six months of his furlough being utilized for the purpose. He should not go up for this training till after he has put in three years' active service.

1,089. (VIII.) **Practical training.**—All students who pass out from Indian colleges should have facilities for a course of practical training in India for one year. Such practical training in India for a period of six months on two or three works should also be given to those recruited from outside of India. Indian college students, besides those in government service, should also be given facilities, at their own expense, for a course of practical training in England within five years of passing out. The students on practical courses in England should pay a maximum fee of £5 per month for their practical training. It is very necessary that the Superintendent of the practical course should be a man of some influence with the eminent engineers in England, and arrangements should also include references to the presidents of various engineering institutions through the Secretary. No Public Works Department man from India should be the Superintendent of the practical course, as he has little or no influence with the English engineers, besides being mostly out of touch with the engineering practices in England.

Mr. J. M. VACHA called and examined.

1,090. (President.) The witness stated that he was an Executive Engineer with twenty-six years' service, all of which had been in the Buildings and Roads Branch.

1,091. The present methods for carrying on works were neither economical nor efficient. His main complaints against the present system were (1) that the superior staff had a great deal too much to do with petty works and repairs, (2) that it was too much occupied with accounts, correspondence and other office work, (3) that the subordinate staff was very inefficient, and (4) that an Executive Engineer's charge was not of sufficient importance to give him that class of work which an officer of his position was qualified to do. The present expenditure in an Executive Engineer's charge was on an average five or six lakhs of rupees a year, about two lakhs for construction, and the remainder for maintenance and petty works. The amount of expenditure on roads and buildings varied considerably, but generally there was more spent on original building work than on roads. Out of Rs. 2,00,000 of expenditure, about Rs. 1,50,000 would be for major works and Rs. 50,000 for minor. The major works would consist mainly of buildings, mostly not very large ones, and only a small proportion would be roads. The largest building in any ordinary division, except Nagpur, would be a high school or very rarely a *kutcheri* costing about fifty or sixty thousand rupees. He did not agree with the view that if the area of an Executive Engineer's charge were extended it would become too large for him to look after properly, since under his scheme he would have a better class of sub-divisional officers and Assistants. The functions of the Executive Engineer should be practically what the functions of the Superintending Engineer were at present. He would prepare his own plans and estimates and supervise the larger works, and he would go more into details than he had at present time to do. The present Superintending Engineer was also more of a clerk than he ought to be.

1,092. With reference to the remark in his written statement that while the Executive Engineer got a fairly high rate of pay the man next below him was sometimes a sub-overseer on Rs. 50 or 60 a month, he explained that this fact was due to the dearth of educated men in the circle. For years together he had had lower subordinates in charge of sub-divisions, and the reason that the Superintending Engineer gave for this was that he was short of upper subordinates. There were only eighteen upper subordinates in the circle, of which nine were men who, after repeated trials, were considered unfit to hold charge of a sub-division and could only be

put on to odd jobs, with the result that lower subordinates had to be appointed to take charge of sub-divisions. He admitted, however, that at present, out of the forty-four sub-divisions in the province three were held by imperial engineers, five by provincial engineers, twenty-eight by upper subordinates and only four by lower subordinates, but what he had stated had actually happened in his division for five years. He added that out of the twenty-eight upper subordinates referred to, there might be some who were not substantively of that rank, as recently sub-overseers placed in sub-divisional charge had also been given that status temporarily. His contention was that there should be a better class of officers just below the Executive Engineer, on salaries of not less than Rs. 150 to Rs. 200. The present class of sub-divisional officer was incapable of discharging the functions which should rightly fall to him. He did not agree with the view that the best candidates available were attracted to the Department by the present rates of pay. On the contrary, the fact was that it was very difficult to obtain good men, and for this reason a number of incompetent persons were tolerated in the Department. He admitted that all the men who came from the Roorkee College, where he also had been educated, accepted government service because there was no private field for them. The reason why sub-overseers joined the Department on so low a pay as Rs. 30 a month was that they had an idea that the Public Works Department afforded opportunities for making money irregularly. The pay of Rs. 30 was only considered as a sort of passport into the Department. Upper subordinates could not be expected to live on Rs. 60 to Rs. 100 for years together. His whole contention was that the right stamp of men were not attracted to these appointments, and that the class of candidate which entered was not good enough.

1,093. He admitted that there were no large private contracting firms of standing in the province which could take up large works, but considered that such firms would spring up if the Department were managed on lines calculated to give them encouragement, by extending technical education and improving the subordinate establishment. He did not mean to suggest that technical education would produce contractors, or that all contractors should be engineers, but he thought that they would employ passed students of the engineering colleges if there was a sufficient number available. At present the number of engineers was quite inadequate. He instanced one case when an engineer had been required, but none was available, and a sub-overseer who

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had been to England for six months had to be appointed in that place. He considered that there was ample scope for the employment of large number of engineers. Those who considered that the market was over-stocked simply looked at the matter from the Public Works Department point of view only. He admitted that it was the invariable practice to call for tenders, but complained that the proper class of contractor was not available, this being, in his opinion, due to the fact that no respectable man with any sense of uprightness would take a contract from the Public Works Department on account of the corruptibility of the subordinate staff.

1,094. He considered that there should be more decentralization in the Department. He was against the system of employing petty contractors as was done at present. He advocated the employment, at the outset, of one or two large contractors for each district who would not only collect material, but who would also repair roads and maintain them, throughout. He did not agree that the roads would not be so well kept under this system as under the departmental system under which gangs were employed. No supervision would be necessary over these contractors as they could be trusted. If it were found that the work was not properly carried out payments should be withheld. He considered that contractors could do the consolidation work properly and stated that he had already had that work satisfactorily done by this method. They would also be able to maintain roads. The best system of maintaining roads was to give out long lengths to large contractors, and not to employ petty contractors at all. He had no knowledge of the system of road maintenance practised in Europe, but considered that the method proposed was well adapted to India. He believed that a somewhat similar system was followed in the *Abkari* department, where work was given out to contractors by districts.

1,095. His experience was that the students turned out by the Roorkee College were the best. He had also experience of men from the Madras, Sibpur and Poona Colleges. He had seen the work of two students of the Poona College, had himself attended the college for a short period in 1889, and had also some relatives who were being educated there. He could, therefore, speak with up-to-date information about that institution. The principal of the college, instead of being an engineer, was a science man, and a man from the railway had been brought in as a professor on civil engineering. He had heard several complaints from the students about the lectures. He suggested that professors for the engineering colleges should be recruited from the Public Works Department for a term of years. At Roorkee they had a very good system of recruiting professors from the Military Works Department, and the principal of the Poona College of Science had, in past years, always been a Public Works Department man. He considered that the system of deputing Public Works Department men for teaching purposes was a good one, and added that it had been tried in some provinces, although with what results he could not say.

1,096. He suggested that there should be an Advisory Board for all the engineering colleges. They would see that the colleges kept pace with modern development, that the students were up to the required standard, that no college became backward, and would deal with other cognate questions. They would advise government and the principals of the colleges from time to time, and would make a tour once a year, not only visiting, but giving advice as well. The Chief Engineer of the province visited should be on the Board.

1,097. He considered that all students should have one year's practical training, and was not in favour of extending the period to two years, as men put in charge of sub-divisions very soon picked up the work. During the theoretical course the students should visit works in progress in the district and take notes. The practical training of one year should, he thought, be given to all students passing out of the colleges, whether they were to enter government service or not. The arrangement should be on the lines at present in vogue for a few selec-

ted candidates, only the number should be enlarged so as to allow of all the students obtaining training. It should not, however, be compulsory for all students to take this training, but government should arrange for all, so that all who desired could have it. They need not be paid anything during the period of their apprenticeship. The witness did not agree with the view that the students were too poor to maintain themselves after the end of their college course, and that unless they were paid a living wage during the period of apprenticeship they would not take advantage of it, considering that they would avail themselves of the opportunity even without pay.

1,098. He suggested that arrangements should be made for students who desired to go to England to get practical training there. He had not seen the report of Sir Theodore Morrison's Committee, but did not agree with their recommendation that not only Indian students, but also students educated in England, should get their practical training in India, as arrangements for such training could not be made in England. He suggested that there should be some obligation on the part of the contractors employed by the India Office to take students for practical training, and that government should use its influence with engineers and contractors to do so. He cited the case of an engineer who had not been able to obtain practical training until government exerted its influence in the matter.

1,099. He recommended that there should be a system of study leave under which officers in the Department could go to England for a certain period for training.

1,100. He suggested the abolition of lower subordinates and the substitution of *mistris* in their place. As to the objection that *mistris* were uneducated, and would hence be unable to do the work at present done by the lower subordinates, he remarked that the latter were doing work which was not properly within the scope of their duties. They took measurements and kept muster rolls and did both poorly. The *mistris* had a professional mind, could recognize the quality of work, and lay out works and buildings. As regards estimating, he considered that this work should not be done either by *mistris* or by sub-overseers, but by the sub-divisional officer. As regards the objection that the *mistris* being less educated would be more prone to corruption, he remarked that the latter's demands would probably be less than those of a lower subordinate as his status was lower.

1,101. He proposed that the Executive Engineer should be relieved of all accounts. He should simply certify for payments, which should be made by the Comptroller. This would not involve the contractors going to headquarters as the Comptroller could send cheques to them. At present the accountant's position was anomalous. He was supposed to be under the Comptroller, but at the same time the Executive Engineer was responsible for the accounts. He admitted that the accountant was subordinate to the Executive Engineer also, and was supposed to be the head of the divisional office in the absence of the Executive Engineer, but he was more concerned with the accounts than with the executive work, and looked to the Comptroller rather than to the Executive Engineer. It would be an improvement on the existing state of affairs if the Executive Engineer made the payments, but the actual accounting were done by a separate and independent accounts branch.

1,102. He proposed that district boards should do all their own works costing less than Rs. 2,500, and should also take over government works up to that amount, all works costing more than Rs. 2,500 remaining with the Executive Engineer. There would be no duplication of staff, as the Executive Engineer would be relieved of a lot of his present work, and his staff would be correspondingly decreased. He admitted, however, that it might happen that on one or two roads the district and Executive Engineers might be looking after buildings in the same area, and that this would involve a certain amount of duplication. He considered that the main

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roads and through communications should remain with the Public Works Department, his underlying idea being that the Department should keep one or two roads as models for the district boards.

1,103. He did not approve of the idea of making over repairs to buildings to the departments occupying them. It had been tried before and had not been very successful. The departments concerned had to depend on their clerks and subordinates for carrying out these repairs.

1,104. The roads that had been made over to the district boards had not been properly kept up as the boards were not given a proper staff. It was laid down by government that a district board should have a supervisor. A lower subordinate was, however, appointed and called a supervisor. It would be well if government laid down that each district board should have a supervisor in charge of the district as at present, but that the supervisor should be a man of the real supervising class. The system would not be expensive if roads as well as petty government-buildings were made over to the district boards. The work would be sufficient to justify the appointment of an engineer on a pay of Rs. 200 to Rs. 250, and a man could easily be obtained on that pay.

1,105. The divisional engineer would look after this officer. The work of the latter would not be too much for him as his duties would in some districts be largely performed by the Superintending Engineer. He would make the district boards contribute for the services of the Superintending Engineer, who should be paid from the same funds as the other staff, i.e., from district board funds, and such provincial funds as might be transferred to the district boards. He was certain that, if the district boards were given proper staff, they would be able properly to manage all the works that might be transferred to them, but could not give an off-hand reply to the question what redress government would have if, even with proper staffs, it was found that the works were being neglected.

1,106. He thought that the five per cent. allowed for contingencies in preparing estimates was quite sufficient and caused no inconvenience.

1,107. He considered that the present system of getting stores from the India Office was quite suitable and that no alteration was required in the procedure. He preferred getting stores from England to buying locally, because they were of better quality and much cheaper. Four years ago he had got cement through the India Office which was of much better quality and cheaper than any cement obtainable in India. He did not think that the system involved any unnecessary delay.

1,108. (*Sir Noel Kershaw*.) He suggested that professors of engineering colleges should be nominated by the Public Works Department for a period of five years, and that the nomination should be made either by government or by the Advisory Board which he had proposed. He admitted that it would eventually mean that the appointments would actually be made by the Chief Engineer, and that there was a risk that, in making such appointments, the Chief Engineer, instead of seeing that a man really fit for the college work was chosen, might nominate a man whom he considered unfit for the Department and wanted to get rid of.

1,109. There should be some rules as to what classes of men should be appointed by the district boards. In their earlier stages he did not think that there would be any objection to government having a voice in these appointments, and saying that a particular man should not be appointed as an engineer; this would give government some sort of control over the boards in regard to the execution of the government work made over to them, and would safeguard government interests. He considered that if the district boards were satisfied that a particular man should be appointed, and government was not satisfied, the latter should have a right to ask the board to dismiss the man.

1,110. (*Mr. Mackenzie*.)—He stated that *mistris* could not use theodolites. They measured buildings with a

square and strings, using triangular checks. Buildings were very rarely laid out with theodolites, so the majority of the works could be managed by *mistris*, and if there was a really important building it could be laid out by an overseer. He added that *mistris* did not do the surveys for roads.

1,111. He agreed that there should be one cadre for the staff of district boards, managed by the Commissioner, so that if a man proved wanting in one place he could be transferred to another. Promotions would be made by the Commissioner, but transfers within the province by the Public Works Department Chief Engineer.

1,112. (*Rai Bahadur Ganga Ram*.) The witness went to England for two years' training, and specialized in sanitary engineering, and had also had practical training in iron works and in workshops. When he came back the Secretary of State specially drew the attention of the Government of India to the advisability of utilizing his services as Sanitary Engineer. He had had no chance till 1894 when the Government of India asked for his services, but the local Government would not spare him. In 1906 he was recommended for the post of Sanitary Engineer, Central Provinces, and on being asked verbally whether he would accept it he expressed his unwillingness to do so. He admitted, however, that he had been sent to specialize in England at government expense.

1,113. With reference to his statement that nine out of eighteen upper subordinates had been condemned as unfit, he considered that government kept them on as there was always difficulty in getting subordinates, and as under the present rules it was not easy to get rid of them. In the Central Provinces there was no engineering college, and consequently the province got only the leavings of the other provinces.

1,114. With reference to his statement as to his inability to obtain an engineer and to his having had to appoint a sub-overseer, he said that he had advertised in the papers but that there had been no response, and the man selected happened to have been a sub-overseer in the Punjab. He did not stay long, but went back to Patiala.

1,115. The biggest metalled road he had charge of was one of three hundred miles in the Eastern Division. The same men who metalled the road did the consolidation. The Public Works Department measured the metal before consolidation.

1,116. There was a circular order which distinctly enjoined that road repairs and metal consolidation by steam rollers should be done by daily labour and not by petty-contract.

1,117. He was of opinion that lower subordinates should be altogether abolished provided, however, the whole of the system was changed as suggested by him.

1,118. When he sent an indent to England, for the cement he required, he was not required to give a certificate whether a similar article of indigenous manufacture was not procurable in India.

1,119. (*Mr. Cobb*.) If anything went wrong in spite of proper staff and proper supervisor, when government roads and buildings were made over to district boards, he suggested that the contractor should be held responsible as he did not want the district boards to work on the Public Works Department system. They should not maintain roads on the lines of the Public Works Department, but should entrust the work to contractors. If anything went wrong the contractors should be heavily fined. There should be a clause in the contract making the contractor responsible for proper work and imposing a penalty in case of default. He considered that contractors would be forthcoming who would sign a contract to that effect. He thought that if there were a better and broader engineering education, engineers would be available to act as advisers to contractors. Thus the bettering of engineering education would tend to the introduction of a better class of contractor.

1,120. He was in favour of admitting more students to the engineering colleges and of opening a new college at

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Bombay instead of enlarging the Poona College. If a new college were opened at Bombay a much better class of students would be attracted as people did not go to Poona because the education given there was not good enough. After passing through that college there was no opening for them except in government service. This, he considered, was not the fault of the students but of the training, and students with good prospects did not go to that college. He did not want the new college to start with the same sort of staff as there was at the Poona College, but would advocate a staff composed of professional engineers. Students should have passed their first arts examination before admission to the college; He considered that, if a college were opened at Bombay,

there would be a sufficient number of students available for it in the Bombay Presidency.

1,121. (*Rai Bahadur Ganga Ram.*) The witness went to Roorkee to become a contractor as he learnt that that was the best engineering college in India. On coming out of the college he found that it was very difficult for an honest man to get on as a contractor in the Public Works Department. There was too much dishonesty in the Department for such a man.

1,122. He had had experience of Berar and considered that the combined cadre system in force for the district boards there was working satisfactorily. He had heard no complaints about it.

At Nagpur, Thursday, 25th January 1917.

PRESENT :

F. G. SLY, Esq., C.S.L., I.C.S., (*President*).

SIR NOEL KERSHAW, K.C.B.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

C. S. COBB, Esq., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

G. A. DURIE, Esq., A.M.I.C.E., Superintending Engineer, Central Provinces.

D. G. HARRIS, Esq. (*Secretary*).

The Hon'ble MR. J. WALKER, C.I.E., I.C.S., Commissioner, Nerbudda Division, Jubbulpore.

Written Statement.

1,123. (*General.*) As I understand the resolution, the Government of India contemplates that there should be a radical examination of the methods under which public works are carried out and, for the purpose of this examination, classifies these methods as (1) execution departmentally by the Public Works Department, (2) execution departmentally by local bodies' engineering staff and (3) execution by private contractors subject merely to inspection. The references that I have received do not, however, attempt to define the essential distinction between execution departmentally and execution by private contractors. Pure departmental execution, I presume, means that the Department supplies the materials and provides the labour. I presume, however, that it is not only such execution that is considered to be "departmental." The amount of work executed departmentally in this strictly narrow sense is, I believe, relatively very small and the great bulk of work is executed by the Public Works Department by means of contractors of the classes mentioned in paragraph 751 of the Public Works Department Code. Such contractors undertake works of construction under supervision, the contractor providing the whole or part of the labour, material or plant required by the engineer, but performing the work under the engineer's direction. The employment of such contractors for the performance of any work in no way relieves the engineer from responsibility as to the manner or time in which the work is done, and the contracts framed give the engineer full power to act for himself in cases in which the contractor delays or fails to do the work to his satisfaction. I presume that the alternative method of execution by contract, which the resolution has in view, is a method essentially different from the method

of execution by contract by which the great bulk of public works are at present carried out, and that the sort of contractor contemplated is a contractor who would be able to perform the work without the detailed direction now necessary in the case of contracts under the Code, and who would be competent to turn out satisfactory work if subjected merely to a limited amount of departmental inspection.

(2). As far as I am aware, in most districts in this province, contractors capable of undertaking works of any importance in this method are practically unknown. The only instance that I am aware of contracts of this nature being given is in the case of the execution of large drainage schemes by Messrs. ———, and the precise terms of the contract given to that firm, and particularly regarding the degree of supervision to be exercised by the Public Works Department, are not known to me. Possibly, in the execution of some of the larger irrigation works and no doubt in railway works, contracts of this class may have been given. In building work at Nagpur, I believe, in the past large contracts have been given to certain firms. But I am not aware whether, in the case of considerable firms like these, the close supervision required by paragraphs 751 and 773 of the Public Works Department Code was in any way relaxed. Until private enterprise develops firms capable of undertaking work as a sort of engineer-contractors it is inevitable that resort, as at present, must be had to contractors working under close departmental supervision and, as I have said before, I presume that, for the purpose of this reference, the execution of works by contract of this kind is to be regarded as execution by the Department.

(3). As far as the possibility of the utilization of private enterprise for the execution of works is concerned, it

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does not seem to me that much distinction is possible between execution by the Public Works departmental staff and execution by the local bodies engineering staff. Local bodies engineering officials, in executing works requiring professional skill, are practically in no different position from engineers of the Public Works Department, and the fact that an engineering department is labelled the Local Fund Engineering Department can make no difference in the responsibility of the particular engineer as to the execution of the work. If the amount of professional knowledge required is so slight that a work can be carried out by village agency with the assistance of local board members, or can be carried out by ordinary contractors under supervision by members of local bodies with the assistance and advice of the local engineering officer of the local fund public works establishment, the responsibility for its execution must lie with the local body concerned and the execution cannot be classified as departmental execution. In respect of all other works carried out by the local fund public works establishment, the position is, I think, on all fours with the position of works carried out by the Public Works Department engineering establishment.

(4). Efficient execution by departmental agency is, of course, impossible without an adequate agency, and adequate agency is not obtainable unless the volume of work to be done is sufficient to justify the cost of entertaining a properly qualified staff. In order to supply the volume of work necessary for the entertainment of a qualified staff under the local fund engineering scheme, a number of provincial roads and other works have been transferred to the charge of the local fund agency. It may be noted, however, that transfers have been often made on the ground of particular works being remote from headquarters, which cannot conveniently be visited by the Public Works' staff so that the transfers, while aiding in the financing of the local fund engineering scheme, have tended rather to make the charge of the divisional engineer, regarded as an Executive Engineer's charge, difficult for adequate inspection. On the other hand, I believe that the effect has been to reduce the charges of Public Works Department sub-divisional officers, in some cases, to less than what an officer of that class could reasonably be expected to look after.

(5). In considering the local fund engineering scheme, it is of interest to look to the history of the policy of the Administration in the matter of the executive agency for local works. This is reviewed at some length in the Secretary to the Chief Commissioner, Public Works Department's letter of the 7th November 1888, which is printed in pages 161—164 of the 1st edition of the District Council Manual. In that letter the Chief Commissioner came to the conclusion that the execution of works for district councils must be the task of the official district staff. All works requiring professional skill were to be placed in the hands of the Public Works Department officers, and for the execution of all works not immediately requiring professional skill and direction, the Deputy Commissioner of the district, with his subordinate staff of all grades, was to be the responsible executive agency. District councils were, however, to retain all their powers of initiation and financial control and they were to decide on the works to be undertaken, settle their order of urgency and request the commencement of work, but their responsibility ceased when they had decided that certain works be undertaken and had allotted the necessary funds for carrying them out. In that letter it was contemplated that *each district* should be provided with an engineer officer and a suitable staff. The next stage was reached when Mr. (now Sir Reginald) Craddock, then Commissioner of the Nagpur Division, initiated the scheme for the provision of a divisional local fund engineer. The scheme suggested is set forth in Sir Reginald Craddock's letter of the 4th January 1906. In that letter Sir Reginald Craddock emphasised the point that neither the district council

nor the Deputy Commissioner had any skilled expert staff to supervise the mates, *mistris* and sub-overseers employed for the petty works left in their charge, and also that for more important work the Executive Engineer, owing to the burden of his proper duties, was unable to give them the necessary attention with any reasonable degree of promptitude. In dealing with the matter, Sir Reginald Craddock did not refer to the pronouncement made in 1888, that each district would be provided with an engineer and a suitable staff, and in fact based his proposals largely on the ground of the inadequacy of the Public Works Department engineering staff, quoting an instance of an Executive Engineer whose charge extended to the whole of the Nagpur Division except Balaghat. In considering Sir Reginald Craddock's proposals, it does not appear that the Administration went into the question why the policy stated in 1888 had failed. Obviously, the policy then declared could not have been given effect to without a considerable expansion and reorganization of the Public Works Department staff, and was impossible with a single Executive Engineer in charge of four such districts as Nagpur, Chanda, Wardha and Balaghat. After trial of the divisional engineer scheme in the Nagpur Division, Sir Reginald Craddock recorded, as Chief Commissioner, a note dated the 6th May 1910 outlining the scheme now in force. It was then decided that there should be a divisional local fund engineer for every revenue division, and the hope was expressed that the Public Works establishment could be lessened and that one Public Works division should be reduced. The scheme thus involved the creation of an engineering establishment, separate altogether from the engineering establishment under the Executive Engineers of the Public Works Department of the Roads and Buildings Branch, and working side by side with the latter throughout the province.

(6). As regards the working of the divisional local fund engineering scheme in this division, as I observed in my review of the reports on the working of the district councils and local boards for 1915-16, I do not consider that it has yet had a fair chance. It has been working only for about three years. The services of the late engineer had to be dispensed with, owing to lack of control and want of proper supervision on his part. Criminal proceedings had to be instituted against overseers and contractors in two districts for malpractices, and they were sentenced to imprisonment and fine. The present engineer, Mr. Hira Lal, was appointed only in February last, and the standard of work under his control is, I believe, rising rapidly. Apart from unsatisfactory staff the following appear to be the main obstacles to the success of the present scheme:—

(i). The divisional local fund engineer has too much ground to cover with a charge reaching from Burhanpur to Sausar. He cannot possibly see all his works sufficiently, especially when he has one or two important works which must take up much of his time. With so large a charge much time must be wasted in travelling, even if communications are good. He can hardly comply with the requirements of rule 137(12) of the Local Fund Account Rules under which in the case of works costing more than Rs. 2,000 he has to give them that amount of attention which an Executive Engineer would give to works under construction in his charge. Also, being a divisional, and not a district officer, he cannot maintain that closeness of touch with the officer in executive charge of the district which it is desirable that all departmental officers in the district should maintain, and especially an officer doing work for local bodies.

(ii). He has too many masters. Counting government in all its departments as only one employer in all the five districts, he has to deal with twenty other employers, viz., with five district councils and with fifteen municipalities.

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As Mr. Wills observes, an extract* from whose letter I am attaching to this report, the divisional engineer and district supervisor cannot be made directly subordinate to the local bodies in their present stage of development. A certain amount of friction has occurred from the claims of local bodies to assert their authority over the local fund engineering department, and some colour is given to these claims by a reference to paragraph 9 of Sir Reginald Craddock's note of the 6th May 1910, referred to in paragraph 5 above, in which it is said that local bodies would not object to the system as the district overseers would be entirely under their orders. It is certain, however, that Sir Reginald Craddock did not contemplate that the local fund engineering staff should be under the orders of the local bodies in respect of the execution of works requiring professional skill. In paragraph 23 of the note attached to the Commissioner, Nagpur Division's letter No. 902, dated 20th February 1906, to the Chief Secretary. He had noted as follows:—

“In a separate note I have strongly urged the employment by local bodies, both district and municipal, of a joint engineer of their own. The more important work which requires the skill of an expert must be executed

*Extract from letter No. 2313, dated the 22nd December 1916, from C. U. Wills, Esq., I.C.S., Deputy Commissioner, Betul, to the Commissioner, Nerbudda Division.

(6). But in these political times when 'efficiency' indicates a narrow bureaucratic outlook, and a strict adherence to principle suggests a want of sympathy, we may take this opportunity of considering further the relations between local bodies and their engineering staff. These relations, to my mind, should present no difficulty. The district council which provides the funds must necessarily control the scheme of expenditure. Individual members should also be encouraged to criticise the character and cost of works constructed, but these criticisms should be conveyed to the local fund engineer by the council in its corporate capacity through the Deputy Commissioner. Neither the divisional engineer nor the district supervisor can be expected to be at the beck and call of the district council, and to accept direct censure at their hands; nor are the members in a position to decide on matters of professional detail. At present the council must be content to formulate their demands, and must rest content if they are complied with with economy and despatch. In years to come, when the status of the members and their sense of public responsibility develop, it will be possible to entrust them with the more personal function of guiding, checking and accelerating the individual activities of the divisional engineer and district supervisor. But this function is at present best performed by the Deputy Commissioner. In a small *mofussil* head-quarter town, the members of the local bodies do not occupy a sufficiently strong social position to permit of their dealing directly on terms of personal authority with qualified engineering officers. Yet such qualified officers are essential. Therefore, the mediation of the Deputy Commissioner is necessary. Later, when the corporate dignity of local bodies is established, it will be time enough for the local fund engineering staff to come in as the immediate subordinates of the local bodies whom they serve.

7. My conclusion in this matter is therefore as follows. There is scope for wide development of the duties entrusted to the local fund engineering department. (All roads, for instance, except the main provincial arteries of traffic should be entrusted to the local agency.) But this involves the employment of men of such standing as divisional engineer and district supervisor that they will demur to being made directly subordinate to the local bodies in their present stage of development. If we raise the cry, as I have heard it raised, that the local fund engineer and supervisor are the servants of the council and must look to them in all respects for guidance, counsel and control, then at any rate for the few districts of these provinces with which I am well acquainted, friction and failure and deterioration are inevitable.

Therefore, the authority of the local bodies must, in personal matters, be exercised in regard to divisional engineers and district supervisors through the mediation of the Deputy Commissioner, who is in a position at once to give weight to the wishes of the council and at the same time to impress their views upon the engineering staff.

by experts and supervised by experts, but the selection of works, the kind of works to be executed, the relative urgency of works, and the supply of funds for their execution must rest with the local bodies. Moreover, if the engineer made the acquaintance of local board members, in whose circles work lay, he would soon himself become conversant with the capacity for assistance in supervision over minor works that he might expect from them, and his appointment would not be a bar or hindrance to their taking a due share in the affairs of their circles." Rules 137(11) and (12) of the existing Local Fund Account Rules are in accordance with these views, and show clearly that the responsibility for the execution of such works rests with the divisional local fund engineer.

Under the rules in force in divisions in the Central Provinces, the local fund engineering staff is under the direct orders of the divisional local fund engineer subject to the general control of the Deputy Commissioner of the district, and the Commissioner of the division. Local bodies may for any special work give direct orders, which may be complied with, provided that it is clearly understood that such instructions must not in any way clash with any orders given by the divisional local fund engineer. Some modification of these rules, I understand, exists in the working rules in force in Berar, and before the receipt of the present reference I had asked the Commissioner, Berar, for information on the point with a view to addressing the Administration regarding the issue of orders to make the matter perfectly clear. I have not received full information on the subject, but it seems to me that, for the scheme on its present basis, the orders in force in the Central Provinces should be maintained, and I agree with Mr. Wills that they need give no occasion for friction if the authority of local bodies over the divisional engineer and district supervisors is exercised through the Deputy Commissioner as he recommends.

(iii). A third matter which impedes the success of the scheme is the delay which is involved under the present account rules before any payment can be made by a divisional local fund engineer. The Commissioner, Berar, has lately recommended that the delay be lessened by allowing payment to be made to contractors as soon as the completion report that the officer in charge of a work is required to submit is signed by the supervisor. The matter is now under consideration. But it seems to me that as prompt payment is essential to obtain work at cheap rates, we must go much further than this and bring the matter of payment on running bills into line with the practice in the Public Works Department. At present a divisional engineer cannot pay a *coolie* employed for petty work without the sanction of the president or chairman of some local body.

(7). Matters (ii) and (iii) mentioned in the last paragraph do not constitute insuperable obstacles to the further expansion of the divisional local fund engineering scheme. But I have come to the conclusion that the considerations mentioned under head (1) are fatal to the scheme working quite satisfactorily, and I consider that the scheme should be a district and not a divisional one. The present occasion, when the organization, methods and procedure of the Buildings and Roads Branch of the Public Works Department are being subjected to radical scrutiny, seems to me to be a favourable one for the advancement of this view. I see no reason why the policy declared by the Administration in 1888 should not have succeeded if it had been possible to give proper practical effect to it and I am inclined to think that the later policy of attempting to maintain two separate skilled public works agencies for the execution of ordinary roads and buildings works throughout the province has proved a mistake. The earlier scheme was, I think, bound to fail in so far as it contemplated that districts should be charges of Public Works sub-divisional officers and not of Public Works divisional officers. It is the divisional officer, i.e., the Executive Engineer or his equivalent that is in immediate charge and in whom is vested the management of all public works in a division. Sub-divisions are formed merely to facilitate the trans-

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action of business and to complete the chain of responsibility, but responsibility remains with the Executive Engineer and he is the real executive unit. No doubt the meagre funds available for the Public Works Department budget, thirty years ago, made it difficult to make Executive Engineers charges coincide with revenue districts. But the case is different now, and I believe that there are few districts in which the volume of combined government and local fund work would not suffice for the employment of an officer of the status of an Executive Engineer, or at least of an officer in charge of an independent sub-division. There are also a very few districts in which the amount of purely government work, and that of local fund work, would justify the entertainment of two officers of that status in the district. The present local fund engineering scheme reproduces, in an aggravated form, the main defect of the earlier scheme, in that the officer in immediate charge of the management of works has a more unwieldy charge than any Public Works Department Executive Engineer ever had. If further transfers of government works to local bodies are made, the effect will be further to lessen the *raison d'être* of the Public Works Department and to accentuate the awkwardness of the Executive Engineer in charge of local fund works being a divisional and not a district officer.

On the whole my conclusion is that the best policy is a reversion to that of 1888, except that district charges should be charges of an Executive Engineer or his equivalent and not mere sub-divisions.

(8). This proposal may seem reactionary, in that a government department would take over all the public works of local bodies requiring professional skill. But I do not think that interference in the execution of works requiring professional skill is a true function of local self-government, or has any such educative value in the development of public spirit in local bodies as would justify any serious sacrifice of efficiency or economy. The maintenance of two separate skilled agencies for the execution of ordinary roads and buildings divided into executive charge of inconvenient size and arranged without reference to the integral unit of Administration, *viz.*, the district, can be neither efficient nor economical. In exceptional cases, where the control of the works of a local body requires the whole time of an engineer of adequate status, the local body might entertain its own engineer. But such cases would be extremely rare in these provinces.

(9). For the successful working of the scheme proposed it is, however, I think essential that the Public Works Department should be brought more into line with other departments in its relation with the administrative head of the district. The Public Works Department should be regarded as a department of the administration, and not as a department of quite exceptional independence. The Executive Engineer should be the assistant, for local purposes, of the Deputy Commissioner in the same way as the Civil Surgeon, the Forest Officer and the Police Officer are in respect of their departments. In this connection, I would invite a reference to the observations of Sir Reginald Craddock in paragraph 15 of his note prepared for the Decentralization Commission printed on page 135 of Volume VI of the minutes of evidence taken before that Commission, in which this point is very clearly brought out. Such "localization" as it may be called of the Department is particularly necessary if the Department is to execute works for local bodies, since it is reasonable that the party supplying the funds should have some opportunity of expressing his views regarding the execution of a work, and the present constitution of the Public Works Department affords little opportunity for this.

(10). The system proposed would not directly affect the possibilities of the execution of works by private agency. But the closer touch of Executive Engineers with local conditions that would result would tend to facilitate the discovery and encouragement of such capacity on the part of private agencies as exists. Also a very considerable latitude should be permitted to local bodies in the classification of their works as re-

quiring or not requiring execution by skilled agency. A money limit should not be imposed, but such classification should depend not only on the nature of the work but on the existence or non-existence of a member of the local body capable of looking after the execution of the work either directly or through contractors working under him. In such cases, though the member should have the advantage of any advice or other assistance that the local Public Works officer could give, the local body and not the Public Works Department, would be responsible for the execution of the work.

(11). I venture to express regret, however, that opinions should have to be given on the present reference before the evidence taken and the recommendations made by the Indian Public Services Commission are known. Among other matters, that Commission was generally to consider the requirements of the public service and to recommend such changes as may be expedient, and the result of its inquiry in respect of the Public Works Department would have been of much value in dealing with the present case.

(12). As regards the particular points mentioned in paragraph 2 of the resolution, I would submit the following observations.

1,124. (I.) *Economy and suitability of methods of execution of public works.*—Constructive criticism of existing methods is rendered difficult by want of experience of any other methods. I presume that by economy is meant cheapness together with efficiency. On the whole, I think it may be said that the Department is efficient in its work, and that though there have been failures, the work is generally well done. I do not, however, think that it can be claimed that the work is cheaply done. Apart from the cost of staff, the rise in rates of recent years has been very marked. I am unable to say whether the rise has been altogether inevitable. The best check on the rise of rates is the encouragement of competition among competent contractors, and whether such competition has been duly encouraged is, I think, impossible for any one outside the Department, as it is now constituted, to say. Rates once fixed tend to become customary rather than competitive. A private contractor could generally secure better results from the rather unsatisfactory Indian labour available, and could act more freely in importing more suitable labour from elsewhere, where necessary. But the larger the responsibility, the greater will be the profit which a contractor would expect for undertaking a work, and this increased profit has to be set off against the greater expenditure on government staff and the less efficient labour associated with departmental execution of work either directly or under mere petty contractors. It would be interesting if a comparison of this nature were worked out in respect of the cost of the Nagpur and other large drainage schemes executed by private firms of contractors. Clear orders also seem necessary in the matters of the technical survey of the work done by such firms and of the inspection of it before it is finally taken over.

1,125. (II.) *Encouragement of other agency.*—As I observed in the last paragraph, I think it is only the departmental officers who can say whether private enterprise has been sufficiently encouraged. It must be of advantage to the country if a class of firms should arise which have a reputation to keep up and whose sole consideration is not to make as much money as possible out of a job, but who would also aim at good workmanship and appreciate the advantage of this in expanding their business. Such firms would afford an opening outside government service for business and engineering abilities. In the ordinary district charges, which I recommend should be formed, the growth of such firms would not, at any rate, for a very long time, render possible much reduction of the superior executive staff. Each district would still require an officer of the status of an Executive Engineer, or his equivalent, to make the necessary survey and inspection on behalf of his employers, both government and local bodies. There might, however, be some saving in the staff of subordinate engineering officials.

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1,126. (III.) **Changes in organization.**—The main modification of the organization of the staff of the Buildings and Roads Branch of the Public Works Department that I recommend is that it be organized on a district basis with an engineering officer in immediate charge of all public works in the district and subordinate to the district officer in all but purely professional matters. The organization of the staff of the Department above the rank of Executive Engineer would, I believe, require little change to give effect to this principle but some modification might be advisable.

1,127. (IV.) **Relations with other departments and sub-branches.**—It may be said that the Department meets the needs of other departments inasmuch as it carries out works when they are duly sanctioned. In so doing, however, the Department has a tendency to take too much on itself in the matter of the acceleration or retardation of the execution of works. As regards the relations of the Buildings and Roads Branch with the other sub-divisions named they are, I believe, satisfactory. But the sub-divisions named are in this province quite minor.

1,128. (V.) **Decentralization.**—I have been unable to examine fully the question whether further decentralization within the Public Works Department itself is needed. In regard to technical sanctions the powers of selected Executive Engineers might, I think, be expanded.

1,129. (VI.) **Simplification of procedure.**—The general tenor of the Code, as now framed, tends to accentuate the excessive aloofness of the Department from the general administration to which I have referred above. Paragraph 2 of the Code lays down that no general rulings of other departments are applicable to the Department, except the rules contained in the Civil Service Regulations, unless they are published in

the Public Works Department. Paragraph 3 says that no order of government relating to the subjects dealt with in the Code, passed before the issue of the present edition of it, should be quoted or trusted to in deciding or submitting for orders any question regarding the business of the Department. I notice that paragraph 377 quotes section 161 of the Indian Penal Code as if it were a departmental regulation, printing two of the explanations as notes and omitting altogether two of the explanations which constitute this section of the Penal Code. The Code aims at being a complete official *vade mecum* for officers of the Department throughout India, and implies that the ordinary executive instructions applicable to officers of all departments do not apply to officers of the Public Works Department *proprio vigore*, but only by virtue of the Code. The Decentralization Commission has condemned this idea, and it seems very desirable that the Code should be recast as recommended in paragraph 229 of that Commission's report. Any special instructions regarding the relations of the Department to the Military Department should form a separate section of the manual.

1,130. (VII.) **Education.**—As there is no engineering college in the province, I am unable to say much. Judging from the number of applications that I received when advertising for a divisional local fund engineer, it would seem that the existing outturn of qualified civil engineers is adequate. That, however, may have been mainly the result of war conditions, and to obtain the full amount of talent available the provision of an engineering college in every province would seem to be desirable.

1,131. (VIII.) **Practical training.**—I am not aware whether any provision is made for the practical training on works of students who are not destined for government service.

The HON'BLE MR. J. WALKER called and examined.

1,132. (President.) The witness stated that he was the Commissioner of the Nerbudda Division of the Central Provinces, that he had held the post of Collector for about 13 or 14 years, and that in both these capacities he had had a certain amount of experience of the work of the Public Works Department. He had also had experience of local self-government as exercised by local bodies.

1,133. In connection with the statement made in his written evidence to the effect that the divisional local fund engineering scheme had not been in force for a sufficiently long period to enable him to judge of its results, he explained that he had only had his present division in mind, and added that during the six years that he had held charge of the Nagpur Division the scheme had worked satisfactorily, although the rules were somewhat fluid. It was felt, however, even at that time, that the local fund engineer's charge was too extensive. Before 1910-11 the scheme was in force only in the Nagpur Division; in that year it was extended to other divisions, and in order to provide a sufficient amount of work, a large number of provincial works were handed over to the local fund agency. This, however, had the effect of accentuating the difficulties of the scheme due to the charges being too large.

1,134. The government roads and buildings handed over to the divisional local fund in his division were not at first always maintained in as good a condition as they had been before the transfer. This he attributed to defective staff and defective supervision, the former of which was now, however, distinctly improving. He explained that his remarks applied chiefly to roads; he had received no complaints about buildings, although he knew of some very bad construction work done by the divisional local fund engineering establishment for local bodies. Though, personally, he had not noticed it particularly, he judged, from the complaints that were made, that the condition of the roads had deteriorated since the introduction of the divisional local fund engineer. This deterioration he attributed to the fact that the establishment employed by the district boards had

not been good enough for the work they had to do; he added, however, that a suitable establishment was now being obtained. The salary paid to the divisional local fund engineer in his division was Rs. 400 on first appointment, and he hoped, if that officer did well, to raise his emoluments by the grant of increments. Formerly, each district had only a district overseer on Rs. 80 or Rs. 90, but this system had proved a failure, and it was felt essential that better men should be obtained. Suitable men were now appointed as district supervisors on salaries of Rs. 100 rising to Rs. 150, and these, he thought, would be able to keep the work up to the standard required. In his division there was, for practically every *tahsil*, an overseer or sub-overseer on about Rs. 40 subordinate to the district supervisor. This constituted the present organization in his division for the execution both of works of local bodies and, in addition, of certain roads and buildings transferred to them by government.

1,135. Given an energetic and reasonably honest staff, the present district establishment of the divisional local fund was competent to carry out in a satisfactory manner the amount of work at present allotted to it. The divisional local fund scheme had, however, proved unsatisfactory owing to the fact that not only had the divisional local fund engineer too large an area under his charge, but also that he had to consider the interests of too many masters or employers, including the district councils, the municipalities and the notified areas and dispensary committees. He considered that it would be an improvement if that officer were rendered altogether independent in the execution of works of the control of those bodies and worked under the direct orders of the Commissioner, with the supervisors and sub-overseers in the districts subordinate to him. The witness admitted that it was an anomalous position for a staff, paid by the local bodies, to be subordinate to an engineer who, as he proposed, would be subordinate only to government, but he saw no way out of the difficulty, as it seemed to him essential, if the divisional local fund engineer were to be responsible as an execu-

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tive agency and not merely as a supervising officer, that the subordinates who were actually carrying out the work should be subject to his orders.

1,136. This proposal raised the question whether the divisional local fund engineer should be an executive agency in charge of the actual execution of work, or whether he should be simply an inspecting or consulting engineer. The witness favoured the former alternative. It would be dangerous, he thought, to regard a supervisor, or any other engineering subordinate below a certain degree of efficiency, as an executive unit, and there were not sufficient local works in the districts to justify the employment of an efficient engineer for each. If the divisional local fund engineer were made simply an inspecting officer, and not an executive officer, it would, he considered, be necessary to improve the district establishment, but even then he doubted whether this staff could ever be constituted as an independent executive unit.

1,137. In preference to this divisional local fund engineering scheme, he suggested a reorganization of the Public Works Department, the object to be aimed at being the employment of an efficient staff in each district. He explained that he had only proposed this alternative after a careful consideration of the difficulties inherent in the existing arrangement, a consideration which had led him to the conclusion that this alternative offered the best solution of a somewhat difficult problem. The district agency which he proposed would carry out practically all the works required by the local bodies as well as those required by government, and by this means he hoped to avoid the duplication of Public Works Department and local fund staff that existed at present. The total expenditure on public works in a district, both by government and by local bodies, was sufficient to justify the appointment of a district engineer of the class he proposed. He had arrived at this conclusion after consideration of the statistics for Narsinghpur, the smallest district in his division, in which the total works expenditure was about Rs. 1,25,000. If a percentage of the expenditure in each district were allowed, and utilized to meet the cost of the district engineering staff, it would be possible even in a small districts like Narsinghpur to employ a district engineer of the lowest grade on a salary of about Rs. 400 a month. An officer of the same status as the present provincial service Executive Engineer would be appointed to the post of district engineer and such an officer could, he thought, suitably be recruited in India. Although the present salary of a provincial service Executive Engineer was Rs. 535 rising to Rs. 850, his experience when advertising for a divisional local fund engineer had shown him that there would be more than sufficient engineers available even on the minimum salary he suggested, viz., Rs. 400. The expenditure of Rs. 1,25,000 on works might possibly justify the appointment of an officer of the status of an Executive Engineer on Rs. 535 rising to Rs. 850, even in a small district like Narsinghpur, as there would probably be a reduction in the subordinate establishment at present employed by the Public Works Department, as his scheme would eliminate all duplication. The witness was here informed that the figures supplied to the Committee showed that in the Central Provinces the percentage of establishment charges on the cost of works varied between 15 and 16 per cent. to which he replied that, even so, an expenditure of Rs. 1,25,000 would be quite sufficient to justify the appointment of the district organization which he had proposed. He had not, as a matter of fact, worked out his scheme in detail in regard to the cost of establishment, and questions would doubtless arise if it were accepted as to whether these charges were susceptible of reduction or not; but he believed that his proposal would prove feasible, even if the cost of the establishment were estimated at as low a figure as Rs. 12,000 per annum.

1,138. He did not approve of the suggested combination of two small districts into one charge, and explained that one of the greatest benefits of his scheme was that the executive units which he proposed would coincide with the civil revenue districts. He would rather have

an extravagant percentage for establishment charges in one or two of the less important districts than a combination of two such districts involving a smaller percentage. It might be possible to appoint officers of the type of the present provincial Assistant Engineers to small districts on lower rates of pay than those which he had previously suggested; an Assistant Engineer capable of holding charge of an independent sub-division would, he considered, do excellently for such a charge.

1,139. His rough scheme contemplated that the whole district staff proposed by him should be placed under the Deputy Commissioner. He had not considered, in detail, what supervision would be required over his district units, but he assumed that some system, entailing the employment of officers of the type of the existing Superintending Engineers, would be adopted. Possibly, one more Superintending Engineer than at present would be required, making three such officers, one for Berar, one for Nagpur and Chhatisgarh and one for the Nerbudda and Jubbulpore divisions. This increase in circle charges would, he thought, prove necessary both in view of the conditions inseparable from the work of local bodies, and also because the district staff would require more supervision than the present Executive Engineers of the Public Works Department required. His scheme therefore entailed, provisionally, the employment of a Chief Engineer and three Superintending Engineers as a supervising staff, the Superintending Engineers being administrative officers as well as inspectors of the works done by the district staff, and exercising such powers of technical sanction as might be considered suitable. The Chief Engineer would be the departmental head of the engineering staff. The Superintending Engineers might be described as an imperial service, and it would be an incentive to good work if it were understood that district engineers of proved merit were also eligible for entry into that service.

1,140. On its first introduction, the service he proposed would have to be a government service. He had been unable to frame any workable scheme under which it could for the present at least be anything else, but although under his system local bodies would be unable, in general, to carry out even their own works, otherwise than through a government agency, they might still be given a free hand to select certain of these works in particular cases and to be responsible for their construction. He admitted, however, that such selection could only be very rarely exercised, and that the delegation of power to local bodies to construct work at their own discretion, and with no technical staff of any kind, would have to be very limited.

1,141. In regard to the contention that any measure which took away from local bodies even the small powers which they now possessed and gave them no scope at all for administering their own works would be regarded as a retrograde step; he stated that he did not think that his scheme would take away any material powers from the local bodies, and that the administration of their works would remain in their hands, it being only in the execution that the difficulty lay.

1,142. He did not think that it was possible entirely to dispense with the control of the Deputy Commissioner, and hence it would not be feasible to remove the district engineering staff from that officer's control, and make it subordinate only to the district council, but if a scheme could be devised whereby that staff could be constituted as a council establishment without lessening its efficiency (having regard to the needs of famine, etc.), he would welcome such a transfer as being a thoroughly popular measure and tending towards the encouragement of self-government. He was afraid, however, that it would be extremely difficult to work out a scheme under which each district staff would be an isolated self-contained unit, although he would favour any scheme under which both district board works and government works would be made over to the district council if a practicable solution to the problem could be devised.

1,143. The district councils in his division were, however, not at present sufficiently developed to be

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entrusted with the full administration of a trained staff. To obviate this he suggested an alternative proposal, which contemplated the institution in each district of something in the nature of a "Board of Works" composed of representatives of the district council and principal municipalities, with the Deputy Commissioner as president. The necessary administrative control could, he considered, be entrusted to such a body, but the creation of yet another board was undesirable if it could be avoided. At the present time, however, the maintenance of government roads and buildings could not be made over to a purely district organization, as the district councils were not sufficiently developed to justify such a step.

1,144. The personnel of the Board of Works suggested by him would consist, in a small district where there were no important municipalities, of possibly two members of the district council and the Deputy Commissioner. In a larger district like Nimar there might be a member from each local municipality, two from the district council and the Deputy Commissioner as chairman. This Board of Works would exercise administrative control over the district staff, the whole of which, with the exception of the engineer, might be placed entirely under it. As, however, it was essential to get first-class men as district engineers, and also in view of famine difficulties, he thought that the district engineers should be excluded from the control of the Board of Works and formed into a service for the whole province. There would also be more chance of promotion if those officers were incorporated in a service, an engineer in charge of a small district having, as a member of that service, the prospect of being transferred eventually to a larger one. He thought also that, as the whole scheme would be in the nature of an experiment, it would be more prudent to have officers of an independent service in direct charge of the works.

1,145. The district engineers would be borne on a provincial cadre administered by the Chief Commissioner. He was not prepared to express an opinion as to whether district boards should be given disciplinary powers over this service of district engineers, but added that he believed that this principle had been accepted in some provinces, and that local bodies had been given powers of appointment and dismissal subject to the approval of government.

1,146. Provided the quality of the district staff proposed by him were kept up, it would be quite adequate to cope with famine works if government reserved to itself the power, in such cases, to indent upon the staff which would be numerically stronger than the present Public Works Department establishment.

1,147. If any scheme were introduced which would result in the whole district staff being placed entirely under the district board, and being entrusted not only

with local works, but with government works also, he considered it essential that government should retain power over the appointment and dismissal of district engineers, even if this power were limited only to approval and confirmation. At present, the government control over district boards had been decentralized and was vested in the Commissioner; he believed that the law required that all appointments made by district councils on salaries of over Rs. 100 should receive the sanction of government, while in addition government had powers to require the dismissal of any district council servant. (The witness promised * to submit a detailed note on the point.)

If the scheme of transferring works to district boards as previously suggested were introduced, although he was of opinion that government should have very full powers over the appointment and dismissal of the district engineers, he considered that a good deal of power could be delegated to the boards so far as the subordinate staff was concerned. Government had power under the Local Self-Government Act to require district councils to comply with their wishes in cases of bad maintenance of roads, defective construction of government buildings, or waste of government funds. In addition, government could hold the Executive Engineer responsible and pass such orders on the district council as might be called for. Under Section 32 of the Local Self-Government Act of 1883, the powers reserved to government were very wide and the Chief Commissioner could even suspend the functions of a district council if it were considered necessary.

1,148. At the present stage of development of district boards, control would have to be exercised by a government agency, but later it might be possible to transfer it to a Board of Works such as he had suggested, and as soon as the district councils proved their ability to undertake satisfactorily the execution of works, the latter could be handed over to them in their entirety. Under this scheme, the Public Works Department Buildings and Roads Branch, would be brought into much closer relations with the district administration, and it would result in the district engineer—instead of being a departmental officer, subject only to departmental control—being to some extent, at any rate, under the control of the Deputy Commissioner or other district officer. This scheme would also be an improvement on the existing system, as at present, in the great majority of cases, the executive officer responsible for the works resided perhaps a hundred miles away, and the departmental representative on the spot was a subordinate possessing very limited powers of discretion, while the mere fact that the Public Works Department was studiously declared to be independent made it difficult for the district officer to inquire into, or expedite matters, which he was enabled to do in the case of his Forest or Police officers. He admitted, however, that the position

* Mr. Walker afterwards submitted the following note :—

Control of government over staff employed by district councils in the Central Provinces.

* The same in Berar except that Commissioner's approval is necessary. (Section 18 of the Law.)

The same in Berar, but all appointments to posts on Rs. 20 or upwards have to be reported to the Deputy Commissioner vide Rule 40 on page 31 of the Rural Boards pamphlet.

The same in Berar (Section 19 (b) of the Law).

Under Section 21(1) of the Local Self-Government Act the district council may employ "such officers and servants as may be necessary" * * * * and may assign to them "such pay" * * * * as it thinks fit.

2. The power to create posts is, however, limited by Rule 128 of the District Fund Account rules, under which the creation of posts of over Rs. 15 per mensem requires the sanction of the Commissioner. (This limit is to be raised to Rs. 100 in the revised rules which have been published for objections.)

3. With regard to the power to appoint particular persons to a duly sanctioned post there is no rule limiting the discretion of the district council which is given by section 21(1).

4. As regards disciplinary powers, the Commissioner may require a district council (or local board) to dismiss any person employed by the council or board whom he may consider unfit. (Section 21(4) (b).)

5. The Commissioner also has power to limit the number of persons employed by a council or board; or to cut down any pay, etc., as he may consider necessary. (Section 21(4) (b).)

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of the Forest and Public works Officers were not quite analogous, as the work of the former brought him into more intimate touch with the people of the district than that of the Public Works Department officer did; but he still adhered to his opinion on the ground that, as the district engineer would be the agent of the local bodies, it would be more essential than ever that he should be brought in some degree under the control of the Deputy Commissioner.

1,149. Beyond suggesting that the Public Works Department should be brought into closer touch with the general administration, as represented by the executive district officer, he had no suggestions to make in connection with the relations of the Public Works Department with the other branches of the administration.

1,150. He was of opinion that the powers of practical control exercised by the Public Works Department over the budget were too wide, with the result that that Department allocated and re-allocated funds without sufficient consideration of the needs of other departments. He had, however, no serious complaint to make, but remarked that the present system, whereby the Commissioner alone had control over these re-allocations and distributions of grants, resulted in information in regard to changes made by the Public Works Department not being received until a long interval had elapsed. For instance, if the Public Works Department were making a bridge over a *nullah*, it sometimes happened it was not till long after the event that he heard that this bridge had been given up and that they were making a crossing somewhere else. As Commissioner, such changes were reported to him, but the Deputy Commissioner never heard anything about them. He cited the instance of a court-house which had been urgently required, and for which the necessary funds had been allocated, but subsequently transferred by the Public Works Department. This state of affairs would be remedied if the Executive Engineer were brought into closer relations with the Deputy Commissioner.

1,151. In regard to a point, previously raised, that changes in the views of the administrative departments concerned as to the works required by them frequently necessitated the revision, of plans and estimates, and sometimes repeated revision, his experience had been that such cases were uncommon. The usual reason for such changes, so far as he recollected, was that the administrative department had decided on something better than it had originally anticipated that it would be able to afford, and such changes were, he thought, legitimate. He admitted that it might prove very inconvenient, and personally did not plead guilty to the charge. He had never had any practical difficulty in obtaining administrative sanction to estimates, and consequently did not think it would make much difference if Commissioners and Heads of Departments were empowered to sanction minor works up to a limit of Rs. 10,000 instead of Rs. 5,000 as at present. Although there would be no harm in increasing these powers of sanction, he did not consider that it was essential.

1,152. (*Sir Noel Kershaw.*) A district council would feel its position very acutely, if, in consequence of waste of government money, the remedy of removing the district engineer from the district council's control were applied by the head of the administration. Sooner than have this happen, the district council would take good care that the work in question was well done, but the quality of the work would, of course, depend on the efficiency of the technical staff. If, however, the course suggested were to be taken, it would mean that the district councils would go back to the position they occupied up to 1883 when the district funds were managed by the executive authorities. The system which was in force under the Local Government Board in England, and which entailed the surcharging of individual members for money that was wasted, would have a very repressive effect on the enthusiasm of district councils, and he did not think that its introduction would be feasible in India.

1,153. If the suggested Board of Works were introduced, he saw no reason to anticipate confusion and difficulty in regard to the respective limits of the authority of the Board, and that of the district council or Commissioner. The Board would be a representative body dealing with a staff which was working for a large number of masters, and its introduction was proposed to obviate the vesting of control in the district council alone. It was an almost necessary consequence, in every branch of business, for bodies of employers to have a little Board of their own. Though such a body was not essential, in view of the remedies permissible under the Local Self-Government Act, to which he had previously referred, he considered that everything possible should be done to avoid having to enforce those remedies, and that such enforcement would be a far greater evil than the constitution of a small committee. He admitted, however, that he was not altogether in favour of the introduction of this Board of Works, if any other feasible solution could be suggested. At present, when particular roads were transferred to a district board, government merely required the maintenance of a ledger account of the expenditure of the grant for the roads and there had been instances in which the roads were not well maintained, and there had been cases where difficulties had arisen in getting the estimates and allotments passed, owing to the cumbersome method in which money was provided through the district funds. The Board of Works, however, could certainly not help much in this respect. If it were thought more acceptable that the Deputy Commissioner should be brought back into the district council again, in some capacity, he would be willing to substitute a sub-committee of the district council for his Board of Works. He recognised that once a separate body, such as the Board of Works which he had suggested, was set up, it would be very difficult to get rid of it again and that it would be easier to deal with a sub-committee.

1,154. (*Rai Bahadur Ganga Ram.*) The divisional local fund engineering scheme was an improvement on the system previously in force under which it had been found impossible to get works done at all, and under which every work costing over Rs. 1,000 had had to be executed by the Public Works Department. Before the introduction of the present system the local fund system of works had been microscopic. By the orders of 1888, to which he had previously referred, the power to execute civil works was taken away from local bodies, and every work costing over Rs. 1,500 had had to be done by the Public Works Department. Works requiring no particular skill, however, were carried out through the agency of the Deputy Commissioner, in other words, by the *tahsildar*, who employed overseers or *mistris*, but in most cases only a *mistri* on Rs. 30 or Rs. 40 a month. The *tahsildar* was president of the local *taluka* board, or *tahsil*, or sub-district board, and this agency was hence a purely executive one under the Deputy Commissioner and *tahsildar*. His desire was to have only one agency in each district, both for government and local fund works. He did not complain of the qualifications of the present subordinate staff, but he aimed at obtaining for the works of each district men of the status and qualifications of Executive Engineers.

1,155. As divisional engineer, the Superintending Engineer appointed under his scheme would have no powers of appointment, dismissal, transfer or punishment over the district engineers. That officer would be the technical adviser of the Commissioner and, if he noticed bad work, would report the responsible engineer to the district board. As to what control the Board of Works should have over the district engineer, whether it should be able to dictate to him in regard to executive matters (as for example whether a particular work should be done by daily labour or under the contract system) or whether it should accept contractors' tenders, these were matters which would require a considerable amount of working out. The question of the power to accept tenders was certainly a difficult one, and he was not

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prepared to say off-hand whether it should be vested in the local bodies or in the engineer.

1,156. The style of buildings erected by the Public Works Department for administrative departments in the Central Provinces was suitable, and was not in any way extravagant. If the specifications erred on the high side the fault lay, not with the Public Works Department, but with the administrative department concerned. As the administrative head of a division, he considered that as a rule the style of, and accommodation provided in, buildings erected by the Public Works Department were not extravagant, with the exception, perhaps, of the new type of *tahsil* office for small *tahsils*. This class of office was constructed in accordance with a standard plan, and the responsibility for the plan lay with the Administration, and not with the Public Works Department. He did not think that the buildings erected for the Police Department in the Central Provinces were unduly expensive, although occasionally this might be the case.

1,157. If his suggestion were carried out, and the district engineer placed under the control of the Deputy Commissioner, he admitted that it would be right, when investigating a question of wastage of government money by the engineer, to hold the Deputy Commissioner jointly responsible.

1,158. (*Mr. Cobb.*) The district engineers, of the status he had suggested, were not designed to fit into the present hierarchy of Executive Engineers of the Public Works Department. If his scheme were introduced, the pre-

sent Executive Engineers could, during the transition stage, be placed in larger districts than the district engineers, and government might possibly make special grants in order to meet the extra cost involved. When the scheme was established, however, there would be, to the extent of twenty-two to ten, a new hierarchy of engineers on a new scale of salaries.

1,159. (*Mr. Durie.*) In connection with the acceleration and retardation of the execution of works, it was a fact that any re-allotment of funds had to be supported by a re-appropriation statement which was sent to the Commissioner. He thought, however, that the powers of Executive Engineers to transfer funds from one work to another should be limited, and that it was preferable that this power should be exercised by the Administration, as distinct from the executive department. This procedure would not usually entail undue delay, even if it happened in a particular case that an engineer working on a bridge found that the foundations were likely to give a lot of trouble, and the Deputy Commissioner was out on tour, unless the latter, not being a professional man, refused to agree to the transfer. To obviate this, there would be a provision for reference in cases of difference of opinion in regard to professional matters, as was the case at present with the Forest Department, and the power given to the Deputy Commissioner in this respect would have to be subject to certain restrictions which would require to be worked out in detail. He was, however, not inclined to give Executive Engineers unfettered powers.

RAO SAHIB R. R. ABHYANKER, L.C.E., Divisional Local Fund Engineer, Central Provinces.

Written Statement.

1,160. (*General.*) I should begin the expression of my views on the various issues raised in the Government of India Resolution No. 06-E. A., dated the 24th November 1916, by submitting at the outset that I feel extremely diffident in offering any definite views on the various points which have been now raised for discussion before the Committee. Since passing the L. C. E. from the College of Engineering, Poona, I have been throughout working under local bodies, and I have had little to do with the Public Works Department direct. Only during the last two years certain roads and buildings have been handed over to my charge for maintenance, and since that time I have come into closer contact with the Public Works Department. The time at my disposal, moreover, was very limited, and I could not, therefore, go as minutely into the various questions as I should have otherwise done. The intimation about my nomination as a witness before the Committee reached me only on the 22nd of December 1916 and I have done my best under the circumstances. With these few remarks, I beg to submit my proposals as follows:—

1,161. (I.) **Economy and suitability of methods of execution of public works.**—The methods at present adopted for the execution of civil works are, (a) by contract; (b) piece-work; and (c) departmental agency. Past experience shows that the first two are more economical, and are generally adopted wherever practicable.

(a) If a reliable contractor can be had, which is very rare, at least in the parts I have to deal with, this system is most economical.

(b) Where reliable and solvent contractors are not available, what is called the piece-work system is resorted to, by which material is supplied or directly purchased by the Department and the labour is done by contract under strict supervision.

(c) Departmental agency is the best, in the absence of honest contractors and suitable piece-workers, if the subordinate in charge is honest, hardworking and a man of business habits, a combination of qualities not easy to have unless suitable arrangements are made for professional practical education by reforming the engineering colleges themselves.

(2) In the departmental agency one gets an equivalent return for the amounts spent. But it all depends upon the honesty of the lower subordinate staff, as the upper

subordinates have hardly any time to supervise closely each and every work carried out departmentally. In *mofussil* places, especially those situated away from headquarters, it is very difficult to check the accounts of the subordinates. Hence, in regard to buildings, the contract agency is generally adopted and is found convenient and cheap. There is a certain binding upon the contractors to finish the work in accordance with the specification, and also within a certain stipulated time, and this responsibility urged upon the contractor by regular agreement greatly helps the Department in pushing the works through. In big places, such as those at head quarters like Nagpur or Jabulpore, where all kinds of materials are readily available and the working staff can be easily controlled by the Executive Engineer the departmental agency is found cheap and economical in the long run. This experiment is actually being carried out by the present Executive Engineer, Nagpur Division, No. I. For road works, materials such as metal, *moorum* and sand are secured by contract and the consolidation and repairs are done by departmental agency consisting of a permanent gang under the supervision of time-keepers and sub-overseers. So far, no contractor has come forward to do the maintenance of roads. At any rate, I have not heard of the road maintenance being carried out by contract. But this is one of the important items of public works where there is much waste, and if private enterprise is encouraged to do the road maintenance there will be great economy. But the question is one of ways and means.

1,162. (II.) **Encouragement of other agency.**—By private enterprise I understand—

(a) engineering firms headed by a man with technical knowledge and with adequate facilities about finance, which can take charge of any work right from the preparation of a project to its satisfactory completion; or

(b) a body of solvent contractors, not necessarily qualified, but who have gained experience in the working of the Public Works Department, and who can afford to appoint a suitable technical staff; or

(c) a good honest contractor of long standing.

(2) Out of these, (a) and (b) are not available in these provinces, owing to the scattered nature of the works. Such firms will have to spend money over the work staff, in addition to the government inspectors, and

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in a province where works of a lakh or two are scattered all over at ten different places over a large area, no private firm will be tempted to take up such works. In the presidency towns like Bombay and Calcutta, where skilled and trained men are available, where all sorts of material can be easily had at a moderately cheap price, private firms are readily available, and are actually doing works, and it is only in these places that private enterprise is both sufficiently encouraged and works executed by these firms are cheap as compared with those done under departmental agency. The firms now in existence at Bombay or Calcutta, or similar firms that may hereafter come into existence will not, I am afraid, be willing to come and work in a province like Nagpur where the situation of works is very unfavourable and the labour and materials, especially of European make, extremely dear. The firms will naturally expect about 10 or 15 per cent. over the estimated amount prepared under the existing schedule, as they will have to locate a number of their qualified and well-paid agents in different places. Thus, it appears to me that there is no likelihood of any economy being effected. However, the experiment is worth trying, by floating a firm of local contractors of long standing with all the facilities of finance, exemption from royalty, etc. Finance is the principal difficulty in the way of private enterprise in the building and allied trades in these provinces. The only source from which the firms can borrow money is a local *Marwari* or a *bania* who is always reluctant to advance large sums, and for the little money he may advance he charges heavy rates of interest, viz., never less than 12 per cent., and sometimes even more. If arrangements are made to advance money to local firms through co-operative societies, a beginning in the matter of giving encouragement to private enterprise may be slowly and cautiously made in some districts of the province. In this respect, co-operation of the revenue officers will be a great help as regards safety of the monies advanced to local firms. Up to now only one European firm has come into the field in these provinces, and they are doing works at 17½ per cent. upon the estimated cost. Whether this enterprise is considered economical from the government point of view I cannot say, as I was never in charge of their work. But somehow or other the local bodies, whose work they are at present doing, have not been satisfied with their work. The building trade is not very attractive, and it will not be paying to European firms of long standing to take up scattered works in these provinces, as the profits accruing will not be enough to pay their own staff. I therefore venture to suggest that the only possible way to encourage private enterprise in these provinces is in the shape of firms consisting of local respectable contractors having a qualified Indian engineer on their staff. The difficulties regarding finance can be overcome by advances from co-operative societies. Co-operation, and sympathy of the Public Works Department, is also necessary. Prompt payments are essential, and I have no doubt that as the status of contractors and private engineers will increase the treatment accorded to them by the Department will also improve. The adoption of this means will not only be a step in the direction of decentralization, but will stimulate the growth of professional engineering firms and will thus encourage industrial activity of the country. The last named kind of private enterprise, viz., (c) a good honest contractor of long standing, is already encouraged in the Public Works Department. There is a wide scope for a reliable contractor in the Public Works Department and the officers of the Department are always ready to welcome such contractors, as they relieve the superior officers of the bother, worry and responsibilities in carrying out each work. But such contractors are very few. The present class of contractors consists of untrained *Telangi Kumbis* who, if left to themselves, even for a little while, invariably substitute bad material and workmanship, if there is the least possibility of their being able to do so without fear of detection.

(3). It is absolutely necessary to exercise some supervision over such contractors, and it is this necessity of

constant supervision in the present situation that is responsible for the costliness of execution. A sub-divisional officer considers himself fortunate if he gets a respectable, competent and reliable contractor. But the price of material and labour going up day by day, the rates not having been raised proportionately to the increase of the dearness of labour and material, good contractors are not tempted to take up works in the Public Works Department. In railways, most of the works of construction of banks and cuttings is done by contract where *Kachhis* are generally working. On interviewing several of the contractors, I am led to believe that the Department is always willing to increase the rate to suit local conditions. However, there is much scope for improvement in the method of encouraging this kind of enterprise by a single contractor.

(4). There should be a list of recognised contractors for each district, and option as regards execution of works should first be given to them. Furthermore, it will be of advantage if a particular contractor is earmarked for certain areas or districts. Men who live upon contract work are at present always impatiently watching for the sanction of the yearly budget, and they do not know where they will get their works in the succeeding year.

(5). If, on the other hand, these contractors are earmarked for a particular area, or a district, and if they know that they will get works continually within that area for a period of at least three years, they will make all the "bundobust" in advance. Labour has become a difficult problem in these provinces, and unless advances are made to them they will never stick to one master. The contractors will keep material such as bricks, wood-work and metal at the quarry, ready in case they are given hopes. If the Department assures them prompt payment, and assures work for long periods, good and respectable contractors will no doubt come forward. This will in fact be the first step towards encouraging private enterprise. But the present rules, and the usual red tape, prevents officers from encouraging such contractors. No sub-divisional officer, or an Executive Engineer, can guarantee work to any contractor, unless he gets estimates duly sanctioned by the Superintending Engineer. When individual contractors are encouraged, in the manner here suggested, the time will probably soon come when they will themselves form regular working firms. I have no belief in the "tender" system. It is merely a farce. The officer will ultimately select the contractor whom he considers fittest for the work on hand. To facilitate work the divisional Executive Engineer, or the present Superintending Engineer, should prepare a list of recognised contractors for each district and the Executive Engineer should have power to select either of them without further reference to his superior. A contractor reported to have been doing his work badly may be struck off from the government list.

1,163. (III). Changes in organization.—Now, as regards any modification of the present organization of the Public Works Department, these will naturally emerge out of the suggestions that I will now proceed to make, as regards entrusting more works to local bodies employing a skilled public works agency. Before doing so, however, I wish to place before the Committee a brief review of the present divisional local fund engineering scheme in these provinces. The correspondence on the establishment required for local fund works began as far back as 1903, and overseers and sub-overseers were appointed for each *tahsil* to carry out the works of local bodies under the control of *tahsildars*. But the staff in the Central Provinces mostly consisted of untrained men, whose salary was between Rs. 25 and Rs. 50 per month. They used to carry out minor works up to Rs. 500, and all works of over Rs. 500 or any work requiring higher technical skill were referred to the Public Works Department.

(2). In Berar, a more efficient staff was appointed, owing to the resources of the district boards being much more ample there than in the Central Provinces. The staff mainly consisted of a supervisor for each district

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and a sub-overseer for each *tahsil*, assisted by additional overseers according to the nature of the works in each district. But, even with this superior staff, the rules did not authorize them to carry on original works over Rs. 1,000. All original works over Rs. 1,000 and repairs of larger amounts were entrusted to the Public Works Department. But it was soon noticed that, in both the provinces, the Public Works Department had enough of their own works to do, and naturally they could not devote as much time as they were expected to do to local board works. The amount placed at their disposal was not spent to its fullest extent. Nominally, the Public Works Department was supposed to supervise works of local bodies; but in practice, it was found impossible for them to do so, as they had no special staff at their disposal for the inspection of local board works. This state of affairs continued till 1906, when Sir Reginald Craddock, the then Commissioner, Nagpur Division, drew up a tentative scheme regarding the appointment of a divisional local fund engineer for the Nagpur Division. Accordingly, a local fund engineer was appointed for the first time in the Nagpur Division in 1907. His duties were to design larger works and larger projects, to make standard plans for smaller works, check estimates over Rs. 500 and generally to make periodical tours of inspection, and advise the local boards in technical matters. He had also to undertake all larger works of district councils and municipalities in the division, who paid a certain fixed contribution towards his salary and establishment on the basis of their average income. The dispensary works, which were hitherto being carried out by the Public Works Department, were also entrusted to him. The divisional local fund engineer of the Nagpur Division had thus to deal with five district councils, twenty municipal committees, and about thirty dispensary fund committees. The district staff consisted of a sub-overseer for each *tahsil*, with a district overseer at the headquarters of larger districts like Nagpur and Chanda. The scheme was tried in the Nagpur Division for about three years and it was noticed that the council could spend the whole of their allotment without any lapses as in former days. The quality and the efficiency of the work was also greatly improved, and the local Administration thought it best to apply the scheme to other divisions of the province as can be seen from the following remarks made by Sir Reginald Craddock, in his note dated 6th May 1910, regarding the divisional local fund engineering scheme.

"To remedy this state of affairs, I proposed, when Commissioner of the Nagpur Division, to appoint a local fund engineer who would undertake all the works which district councils and municipalities now pay for. This was sanctioned, and for the last three years there has been a local fund engineer in the Nagpur Division, who has considerably improved the celerity and efficiency of public works construction."

(3). The scheme having thus proved successful, divisional engineers were appointed in all the divisions, including Berar. But the district staff was not considered strong enough to cope with the increased work. Liberal grants for schools, sanitation, wells, improvements to village roads were being received by the government year after year, and it was deemed necessary to entertain a more qualified staff to take charge of each district. But the resources of the councils in the Central Provinces were not sufficient to meet the expenditure of a well-qualified staff, and hence it was decided that the district councils should take over certain roads and buildings under their management from the Public Works Department, in order to enable them to appoint a better qualified staff from the supervision charges they might receive from the Public Works Department for the transferred roads and buildings. The percentage charge for supervision is fixed at 11½ per cent., of which 10 per cent. is for supervision, and 1½ per cent. for tools and plant, on the total allotment placed at the disposal of the district council. The said transfer of buildings and roads actually took place by the end of 1914-15, and supervisors were appointed in all the districts,

I give below, in a tabular form, the amounts spent, the expenditure incurred on establishments, and the percentage which the charges of establishment bear to the actual expenditure on works under the district councils in the years 1914-15 and 1915-16.

Average expenditure on district council works in the Nagpur Division in 1914-15 and 1915-16.	Cost of district staff.	Contribution towards local fund engineer.	TOTAL.	Percentage.
Rs. 2,71,300	Rs. 31,032	Rs. 12,441	Rs. 43,473	16 per cent.

NOTE.—Of which 12 per cent. represents district staff; 4 per cent. represents local fund engineer.

(4). The average percentage of establishment works out to 16 per cent. of which 4 per cent. is the cost of the divisional local fund engineer and his staff, the remaining 12 per cent. being the cost of district staff; in other words, the cost of establishment under "Direction" and "Construction" came to 4 per cent. and 12 per cent. respectively. The divisional local fund engineer has been placed in executive charge of all works going on in the division, and is held personally responsible for the completion of the programme of works sanctioned during the year. Consequent on the transfer of certain roads and buildings from the Public Works Department to the management of local bodies, certain definite rules were framed on the line of the Public Works Department Manual of Orders. By virtue of these rules, the divisional engineer has been made responsible for the execution of all works over Rs. 200, with the help of his subordinate staff which is to work under his orders. Works below Rs. 200 are supposed to be carried out by the local boards through village agency. Since the framing of these rules, all the district council works have been completed and the annual allotment for transferred roads has also been spent to its fullest extent, and the local bodies are now in a position to undertake any large building projects in their districts. In fact since the introduction of the scheme, the local bodies have been able successfully to carry out larger building projects costing up to a lakh. Still the fact cannot be disguised that there has been general discontent about the scheme among the local bodies concerned. The entire divisional engineer and district staff practically forms their Public Works Department, and is mainly paid by them; yet the councils seem to view the scheme with some amount of displeasure. So far as I can analyse the situation, the councils seem to want to have execution of works in their own hands, and the subordinate staff to work under their own orders. There is considerable force in the argument that if local self-government is to be real, the district Public Works Department staff should be under the administrative control of local bodies. But, so long as each district council has not the resources to maintain a fully competent engineer for itself, the present arrangements seem to me inevitable. Another objection to the scheme is that the local bodies do not consider that a single engineer could do the work of a whole division. This view also is largely correct. Looking to the vast area of five districts the engineer is to travel, and looking to the number of works scattered over the large area in his charge, it is not possible for one single engineer to give as many visits to works as he is expected to do.

(5). Besides this there are several obstacles in his way, namely, (a) enormous delays in payment to contractors; (b) unnecessary interference in the execution of works requiring professional skill; (c) dual control over the subordinate staff. If these obstacles are removed, and district engineers substituted, which I am going to propose for the present, the divisional local fund engineering scheme will, it appears to me, be an ideal arrangement.

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Since the transfer of roads and buildings, the Public Works Department have reduced some of the sub-divisions, and by further decentralization and re-organization it is possible for the Public Works Department to effect further reduction in the staff. My proposal is that a qualified engineer should be appointed for each district, and to him should be entrusted all construction of original works up to Rs. 50,000, whether belonging to local bodies or not; the maintenance of feeder and unimportant roads is already entrusted to him. The distinction between the so-called "Imperial" and "Provincial" works should be done away with. For instance the post office and the *tahsil* buildings in Brahm-puri are maintained by the Public Works Department, while all the other provincial buildings are maintained by the local fund engineer.

(6). As regards execution of works, it must always rest with a well organized trained staff under the technical control of Public Works Department officers. The experiment of getting district council schools, and other works, carried out departmentally through members was tried in one of the districts of the Nagpur Division, and it proved a complete failure. Almost all the works were badly done, and in most cases the estimates had to be revised in the light of the expenditure incurred by the non-official lay member. There are very few non-official members who evince active interest in the works, and those who are willing to spare their time do so only in case the work conduces to the improvement of their own village. The district councils make their own budgets; sanction the programmes of yearly work and retain the classification of works and the financial control entirely in their hands. Since the introduction of the scheme, powers of district councils in respect to administrative sanction of works, and also in respect to establishments, are greatly increased. The chairman has power to sanction any requisition up to Rs. 300. The council can sanction an estimate up to Rs. 5,000 as against Rs. 1,500 in former days. Similarly with regard to establishments, councils can appoint any subordinate on Rs. 100 without reference to the Commissioner. With these increased powers on the part of the district councils it is quite possible to entertain the services of the district engineers at each district and possessing powers approximating to those of an Executive Engineer. This district engineer should be regarded as a local executive officer in his district (both for the local board as well as the Public Works Department), and should work under the civil control of the Deputy Commissioner. I further beg to propose that the executive unit of the divisional Commissioner should coincide with the executive unit of the Public Works Department. The co-ordination of the Public Works Department divisions with revenue divisions will facilitate working a great deal, and will also reduce unnecessary correspondence and delays. Several estimates of the Public Works Department are to be administratively approved by the divisional Commissioner. If a senior Executive Engineer, with powers of a Superintending Engineer, is placed in charge of a division coterminous with the divisional Commissioner, the work of the Public Works Department administration will greatly improve. The divisional Executive Engineer will then remain under the civil control of the divisional Commissioner. The executive staff will thus roughly consist of five divisional Executive Engineers, with powers of the Superintending Engineer, and twenty-two district engineers, with powers of the present Executive Engineer of the division.

(7). Under the arrangement suggested above, the direction of general policy vests in the local bodies, as regards their own works, while the execution of works with certain reservations vests in the Public Works Department. The district councils and local bodies may cause the district engineers to furnish any returns, or reports on progress of work, or on other matters appertaining to their administration, and they should retain the financial control. But with regard to execution of works the district engineers should have a free hand in the matter, and should work under the technical control of

Public Works Department experts. This system will have the advantage of ensuring a continuous and strong executive administration, by an efficient paid staff, while maintaining the corporate control and activity of district boards or district councils. This system will also remove the difficulty now experienced in the administration of local fund public works, especially when non-official chairmen are busy professional men. At present chairmen of local boards are authorized to carry on works up to Rs. 200, with the help of village agency. But this is not actually done in practice. For a work of even Rs. 10, the sub-overseer is asked to prepare an estimate and furnish a bill. This may be done away with. The limit of minor works carried out by village agency should be raised even up to Rs. 500, and the chairman of the local board, whether official or non-official, should have all discretion in regard to the disposal of such works.

(8). Again, I would like to point out that the existing system of execution of civil works in each district, through the dual agency of Public Works Department and local fund divisional engineer, though it may be suitable to some extent, cannot be considered to be economical. There is, it appears to me, an unnecessary duplication of executive machinery. The staff of each agency, while passing over either the roads or buildings, whether in the construction or in maintenance, devote their attention to only such works as are within their own jurisdiction, and naturally overlook such works as are in charge of the other agency. They cannot make for economy as, under those circumstances, the time and energy of both the agencies are partially wasted. On the other hand, if there is only one agency in a district, there will be no such waste of time and energy, as full advantage could be taken of such journeys for purpose of inspection and control. There would at once be a saving on one set of establishment and travelling allowances that have to be paid. Again, if there is only one agency of execution in a district, it could have full command over the local labour, and avoid competition between contractors of both the agencies. It is now to be considered which of the two respective agencies, local fund or regular Public Works Department should be expanded, and which reduced. To stimulate industrial activities, and as a further step towards decentralization, the expansion of the local fund agency is obviously the one which must be advocated. Instead of having local fund engineers for each civil division, as at present, the introduction of district engineers with qualifications of Assistant Engineers, but with powers of the present Public Works Department Executive Engineers will, it appears to me, promote both economy and efficiency. As regards superior engineering supervision of works, requiring higher technical skill, and for the general supervision over district Engineers, divisional Executive Engineers, of the rank of the present 1st grade Public Works Department Executive Engineers may be advantageously and economically employed, and the functions of Superintending Engineers should be merged in those of the Chief Engineer.

(9). I now come to the Public Works staff. The Public Works Department of the Central Provinces and Berar at present consists of 1 Chief Engineer, 2 Superintending Engineers, 10 Executive Engineers, and, on an average, 4 sub-divisional officers under each of the Executive Engineers. The administration of the Department is under the Chief Engineer, and his staff consists of 1 Under Secretary and 1 Assistant Secretary with a fully-equipped office. If the figures of the cost of original works and repairs, and the expenditure incurred on establishment for the last three years are taken into account, it will be seen that about 30 per cent. of the total outlay on establishment is spent on the staff under the head "Direction." It seems to me that some economy is possible in the establishment charges, by reorganization of the staff and decentralization of powers to various subordinate officers, as outlined by me above. In the year 1914-15 the original works and repairs cost about Rs. 61,67,000 in round figures, as against the establishment charge of Rs. 10,19,000 which are equiva-

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lent to 16.94 per cent. on total outlay. In the year 1915-16 the total outlay was estimated at Rs. 52,45,000 and Rs. 10,30,000 on works and establishment, respectively, and the percentage which the charges for establishment bear to the estimated expenditure on works and repairs came to about 19.64. In 1916-17 the establishment charges are estimated at 24.36 per cent. of the total outlay on works Rs. 42,70,000 and on establishment Rs. 10,40,000. The latter two are estimated figures, while the former is actual. Thus, on an average the percentage which the cost of establishment bears to the expenditure on works and repairs comes to about 20 per cent. These charges are exclusive of the works establishment which are charged to the estimates, which I am informed are never more than 4 per cent. Out of the 20 per cent. on establishment 6 per cent. are appropriated by "Direction," i.e., the Chief Engineer and 2 Superintending Engineers, with their establishments, and the remaining 14 per cent. cover the "Construction," i.e., the Executive Engineers, sub-divisional officers and other lower subordinate staff. In case the district engineers' scheme, as suggested before, is considered practicable, and is accepted, it is possible to effect some economy in the higher Public Works staff. There are in all twenty-two districts in this province of which six are considered first-class, ten second-class and six third-class. For a first class district, a district engineer of the rank of provincial Executive Engineer will be necessary. For a second-class district Assistant Engineers, first grade, and for a third-class sub-engineers, first grade, with powers of Executive Engineers, will be able to cope with the work. The divisional Executive Engineer will be an officer of the rank of senior Executive Engineer of tried abilities. It is premature to offer definite suggestions regarding reorganization on these lines at this stage. But one thing is certain that there could be no reduction in the "Construction" and "Supervision" staff as long as the present methods of the Public Works Department are not changed. But with centralization of powers in the divisional Executive Engineer, some economy in the higher staff, namely, the Chief Engineer and Superintending Engineers, is likely to be effected. As regards the main trunk roads, they must remain exclusively under the Public Works agency, and under the direct control of the divisional Executive Engineer, who will have a separate staff consisting of upper subordinates and sub-overseers according to the lengths of roads. There will be one objection to this system, namely, that the district and divisional staff will travel for inspection by one and the same road, but this is unavoidable in view of the importance of the maintenance of these roads. For building projects over Rs. 50,000, a special temporary staff may be appointed, from time to time, chargeable to respective works.

(10). Now that the standard plans are prepared and administratively sanctioned for various classes of civil buildings and architectural designs required for imperial works like council chambers, general post offices, etc., etc., are generally received from the Government of India Architect, the work of the divisional Executive Engineers and district engineers will be rendered rather easy and where standard plans exist, the final disposal of all the works could safely be entrusted entirely to those officers.

(11). As far as my information goes, I can say that there is too much office work for an Executive Engineer of the division, owing to his powers being restricted, with the result that the actual execution of works is naturally left to his assistants. If the Manual of Orders is so revised as to give more powers to the divisional Executive Engineers and district engineers, with regard to sanction of estimates and contracts, the office work will be greatly reduced, and they will be more free to make periodical inspections. It will be a great relief if an attempt is made to discourage red-tapism which generally exists in all offices.

1,164. (IV.) Relations with other departments and sub-branches.—So far as my experience goes, the Public

Works Department meets the needs of the other departments of the administration, and the relations *inter se* of the various sub-divisions of the Buildings and Roads Branch, sanitary, architectural, electrical and civil engineering are satisfactory. Sometimes, complaints are heard regarding delays in complying with the works of certain departments, but they are unavoidable, owing to the multiplicity of bodies and departments they have at present to deal with.

1,165. (V.) Decentralization.—Further decentralization, within the Public Works Department, is desirable with regard to (a) establishment, (b) accounts branch, (c) administration. As to (a) I have made a few remarks while dealing with point (III.). As to (b) it is advantageous to appoint a committee consisting of experts in the accounts branch, and experienced officers in the Public Works Department to consider if the present account rules cannot be simplified. As to (c) the powers of Superintending Engineers and Executive Engineers should be greatly increased as regards sanctioning estimates, etc. I have already suggested that the divisional Executive Engineer should exercise the powers of the Superintending Engineer, and the functions of present Superintending Engineer should be merged into those of the Chief Engineer.

1,166. (VI.) Simplification of procedure.—The Public Works Department Code is not being made use of in the Local Fund Department, and hence I am unable to say anything on this point.

1,167. (VII.) Education and (VIII.) Practical training.—The education in large colleges, such as Roorkee, Sibpur and Poona is excellent. But more practical training will improve the career of the students, and will make them fit both for private enterprise and government appointments. At present, the students have too much theoretical work to do while in college. The syllabus, which is at present very exhaustive, requires radical change. There is too much chemistry, physics, and branches of mathematics such as conic sections, etc. It will be better if the principal of the college is selected out of the Public Works Department. In the Poona College of Engineering, where I studied a few years ago, it was the practice to appoint senior Executive Engineers of the Public Works Department as principal before being raised to the position of Superintending Engineer. The object of this, apparently, seemed to be that the students should have the advantage of being coached in a practical manner, so as to make them fit to take charge of any office in the Department after they pass. Among the departmental principals I know of are Mr. H. F. Beale now the Superintending Engineer, Central Division, Bombay, Mr. F. L. (now Sir Frederick) Sprott, the President of the Bombay Improvement Trust, and Major (now Colonel) Scudamore, R.E., the present Superintending Engineer of the Southern Division of the Bombay Presidency. After Major Scudamore retired from the college, a professor of science has been made the principal of the engineering college. Provided a senior Executive Engineer, with requisite qualifications for the headship of an engineering college is available, his appointment would be an ideal arrangement. Another advantage of a departmental officer being the principal of the engineering college is that he, in his capacity as Superintending Engineer, may select some of the picked students for holding appointments of temporary Assistant Engineers in charge of large works, or to be the head of a private enterprising firm that the Government of India now desire to encourage. The students must be taken to works in progress and shown what they have to do in the world. At present there is some practical training given in the shape of road or irrigation surveys and geological excursions, but the students are not ripe enough to grasp the instruction imparted. I may recommend that after completing the theoretical course, one year's practical training in the college itself be made compulsory. The college should undertake some building projects every year to be executed under the supervision of senior students.

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1,168. (President.) The witness stated that he was a graduate of the Poona College and that he had put in eleven years' service, all of which had been under local boards. For about four years he was district supervisor in Berar, and had been local fund engineer for 7 years.

1,169. He expressed a preference for the employment of contractors for the execution of works, if such contractors were available, and suggested that a contractor might be earmarked for a certain district, or number of districts, although he admitted that he could not always get good contractors for carrying out local fund works, and that the number of such men who could execute a work from beginning to end was very limited. Some undertook the work and left it before completion, greater difficulty in this respect being experienced in outlying places than at headquarters.

1,170. He recommended that the system of road maintenance by contract should be tried, as he thought it would result in greater economy. He admitted, however, that he had not himself tried it as there were several difficulties in the way. The system had been introduced, in so far as metalling and consolidation of roads were concerned, but repairs had been done departmentally. Under the existing system, there was a good deal of waste, as road gangs were constantly employed and unless they were properly looked after and supervised they wasted their time, and the roads deteriorated. There was only one sub-overseer for a whole district who was supposed to look after road maintenance in addition to his other duties. To remedy this defect the efficiency and number of the staff should be increased. The complaint that the establishment charges were already too high did not hold good in the case of local fund works.

1,171. One of the difficulties in the matter of the employment of contractors was that, as a rule, they had not sufficient funds. He had suggested in his written evidence that the co-operative credit societies might be induced to help them, but admitted that he himself did not know anything about the aims and objects of these societies, and had only made the suggestion as he learnt that they gave money at a low rate of interest.

1,172. An advantage of the system of registering contractors, and giving them all the works in particular districts, would be that such men, being assured of work for three or four years, would be able to keep a supply of materials ready. Thus, if one of them had an opportunity of getting certain materials cheap, he would purchase them for stock. He did not think that this would crush competition, as no big contractors were in existence at present, and he had suggested this method merely as the first step towards the encouragement of private enterprise, and believed it was in fact the only one by which contractors could be encouraged. He would stop the system as soon as new firms of contractors were forthcoming, but considered that there was not much likelihood of that. Applications for registration should be forwarded by the Public Works Department to the Superintending Engineer, or to the district engineer, in the case of local board works, with recommendations as to whether the applicant was solvent, whether he had previous experience of contract work, whether he could afford to keep a *mistri* or a sub-overseer and whether he was in other respects a good man. If these conditions were fulfilled, the applicant would be registered as a contractor. He admitted that this system would tend to create monopolies, but was willing to risk this in order to stimulate interest in contract work which was at present entirely wanting.

1,173. He had had local fund experience in Berar, but at that time there was no local fund engineer there; his experience in that capacity had been confined to Nagpur. The local fund engineer, among his other duties, prepared projects; all projects costing over Rs. 5,000 being sent to the Superintending Engineer

for approval. The latter scrutinised them, and, if accepted, they were sanctioned by the Commissioner. Local bodies did not pay for the technical assistance of the Superintending Engineer.

1,174. The witness was in executive charge of all works in his division, and was himself responsible for their execution. The system was not satisfactory, as he had too many masters to serve. The requirements of the boards clashed with one another, and he was often placed in difficult positions. The district staff was very bad, consisting only of a supervisor on Rs. 125—150 and a sub-overseer for each *taluka* on Rs. 50 plus Rs. 15 travelling allowance, these salaries being quite inadequate for the duties to be performed. The sub-overseers had too much to do and were too few in number. He did not get good men as supervisors, as the pay was not attractive enough. He recommended an increase in the number of subordinates, and an improvement in the prospects of the supervisors, suggesting that if supervisors could rise to Rs. 200 the posts would prove more attractive. He admitted this would entail a good deal of expenditure, and that the scheme proposed would not be cheaper than the existing Public Works Department system. The cost of the district establishment amounted at present to 16 per cent. of the work executed by it, or to 12 per cent. if minor works undertaken on behalf of municipalities were added.

1,175. The divisional local fund engineering scheme was unpopular for two reasons,

(1) that the district councils wanted to execute their own works; and,

(2) that they wanted charge of their own staff, and wished to select their own contractors. If the divisional local fund engineer wished, for example, to make an advance, or some similar concession, the district councils were unwilling to permit it without their formal approval. If there were a slight change to be made in an estimate, they wanted to be consulted, and, in general, they desired that the engineers should be under their orders. He admitted, however, that they did not want to interfere in the actual construction of works, but that all that they really aimed at were powers of control. They felt that some of their powers had already been usurped.

1,176. The whole of the district staff employed for the execution of works was under the orders of the divisional local fund engineer. Appointments were made by the district council on his recommendation. The Deputy Commissioner had power to dismiss overseers, and the Commissioner to dismiss supervisors, on the recommendation of the divisional local fund engineer and the district council. As a matter of practice, all correspondence of this nature passed through the district council. The staff were paid direct by the council, and the complaint of the latter was that they were actually paying for a staff over which they had no control whatever. The witness also complained that he had too large an area to supervise, and stated that the only remedy for this defect was to increase the number of divisional fund and district engineers. With reference to the remark in his written statement that there was unnecessary interference on the part of district councils in regard to professional matters connected with the execution of works, he admitted that they did not often interfere in the actual construction of works but only in the selection of contractors, although occasionally they interfered in the actual construction as well.

1,177. With reference to the remark in his written statement, that the experiment of getting district schools and other works carried out departmentally through members was tried in one of the districts of the Nagpur Division and proved a complete failure, he explained, in detail, the experiment which was tried in the Warda district. About half a dozen schools were to be built by the members themselves. In the case of one school for which a sum of Rs. 2,900 had been sanctioned, he was asked by the district council to advise when the

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[Continued.]

work reached the roof level. He inspected the work and found that the money had been altogether wasted. An extra sum of Rs. 500 had to be spent and the estimate to be revised. The experiment did not fail because the particular member was unduly extravagant, but ten such cases had been tried and in each one the experiment had proved a complete failure, although each time the members had thought that they could do the work cheaper than by utilizing professional agency. In these cases there was no direct supervision, although a supervisor used to go to give technical help whenever required by a member. The witness had not himself had much experience of small works carried out by individual members. The work referred to above was given to a *malguzar*. He was hence unable to recommend any system under which works might be carried out by members, or even by responsible *malguzars*.

1,178. The scheme he recommended was that there should be one district engineer in each district responsible for government works and for all local board works as well, i.e., only one agency, thereby avoiding the present duplication of staff. The Executive Engineer, who must be a government officer, should be under the control of the Deputy Commissioner, just as the Civil Surgeon and Forest officers were. He would have no objection to any scheme under which district engineers would be placed under the district councils, if the latter were rich enough, and had sufficient works to enable them to maintain an Executive Engineer of their own. He did not, however, think that the stage had been reached where government could safely entrust its works to the district board agency, as the latter could not control such large works as the Public Works Department had to do. Of the two alternatives, that the district engineer should be a government servant subject to the Deputy Commissioner, or that he should be a district council servant subject to the district council, he recommended the first. If he had to do public works, he must be responsible to the Public Works Department. As regards local board works, the boards might direct him, and he might correspond direct with them, and the district councils might require him to furnish reports, but he should be subject to the technical control of the Public Works Department. His objection to the proposal to hand over government works to the district councils was that the latter would not have sufficient control over the district engineer, and hence the work would not be so efficiently done.

1,179. Under the scheme proposed in his memorandum he divided the province into twenty-two districts of three classes, with the following rates of pay attached to the district engineers—

	Rs.
First class	600—850
Second class	400—600
Third class	250—400

There would also be a certain number of divisional Executive Engineers on Rs. 1,200—1,500 with powers of Superintending Engineers. He thus proposed the creation of more Executive Engineers, with lesser salaries and enhanced powers, and also more Superintending Engineers. According to his calculation this scheme would effect a saving of Rs. 2* lakhs annually.

* Mr. Abhyanker afterwards elaborated his scheme, as follows, in a letter dated the 26th January 1917.

The Department will be under one Superintending Engineer (Imperial) with powers of the Chief Engineer, assisted by one Under Secretary, with a staff as large as the present Superintending Engineer's office. He will also act as the Secretary to the Hon'ble the Chief Commissioner in the Public Works Department.

Under him there will be five Executive Engineers in charge of the five civil divisions of the province with powers of the Superintending Engineer.

For each of the civil districts there will be one district engineer with powers of the present Executive Engineer. Out of the twenty-two districts, six are considered first-class, ten second-class and six third-class.

For a first-class district there should be a district engineer of the rank of present provincial Executive Engineer.

1,180. The main trunk roads should be in charge of the divisional Executive Engineer (an officer exercising the same powers as the present Superintending Engineer) who should have a separate staff for the construction and maintenance of such roads and for large buildings. His objection to handing over the main roads to district engineers was that they would, except in small stations, be already very busy and it might not be possible for them to devote sufficient attention to this side of their work. He therefore proposed that the main roads should be under the Superintending Engineer as a safeguard against deterioration. He admitted, however, that the maintenance of trunk roads did not require any great engineering skill, and that he had made his proposal only with a view to reduce the work of the district engineers. He also admitted the general proposition that a district officer could look after a road much better than a Superintending Engineer who had a large area to supervise.

1,181. He suggested that students should undergo one year's practical training to be carried out in the college which should undertake some small building projects and execute them under the supervision of senior students. He admitted, however, that it would be a

Out of the ten district engineers of second-class districts, five should be Assistant Engineers, Imperial, and five junior provincial Executive Engineers.

The six third-class districts should have sub-engineers, first grade.

With these few remarks I herewith enclose a statement showing the cost of the staff required.

Statement showing the cost of the staff required.

Particulars.	Pay per mensem.		Per annum.
	Rs.	Rs.	
Superintending Engineer and his staff as per Superintending Engineer 1st Circle, vide page 63 of Public Works Department, Buildings and Roads Branch, Provincial Civil Works Budget for 1915-16.			64,000
1 Under Secretary on Rs. 1,000 per mensem including local allowance, etc.	1,000 × 12		= 12,000
5 Divisional Engineers average pay for each Rs. 1,100 plus travelling allowance Rs. 300 total.	1,400 × 5 × 12		= 84,000
Office establishment for above Rs. 700 plus travelling allowance Rs. 50 total.	750 × 5 × 12		= 45,000
Subordinate executive staff to supervise roads of through communication—			
2 Supervisors @ Rs. 250 including travelling allowance	500		
2 Overseers @ Rs. 150 including travelling allowance	300		
4 Sub-overseers @ Rs. 70 including travelling allowance	280		
TOTAL Rs. 1,080	1,080 × 5 × 12		= 64,800
<i>1st Class Districts (6).</i>			
6 District engineers average pay for each Rs. 700 plus travelling allowance Rs. 200 total.	900 × 6 × 12		= 64,800
<i>2nd Class Districts (10).</i>			
5 Assistant Engineers (Imperial) average pay Rs. 600 plus travelling allowance Rs. 200 total.	800 × 5 × 12		= 48,000
5 Assistant Engineers, 1st grade, average pay Rs. 450 plus travelling allowance Rs. 200 total.	650 × 5 × 12		= 39,000
<i>3rd Class Districts (6).</i>			
6 District engineers of the rank of Sub-Engineers, average pay Rs. 300 plus travelling allowance Rs. 150 total.	450 × 6 × 12		= 32,400
Office establishment of 22 District Engineers.	600 × 22 × 12		= 1,58,400
<i>Lower Subordinate staff for 22 Districts.</i>			
15 Supervisors @ Rs. 250 including travelling allowance	3,750		
22 Overseers @ Rs. 100 including travelling allowance	2,200		
100 sub-overseers @ Rs. 70 including travelling allowance	7,000		
TOTAL Rs. 12,950	12,950 × 12		= 1,55,400
GRAND TOTAL			7,67,800

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better plan if, at the end of their college course, students were required to undergo practical training either in the Public Works Department or under some reliable contracting firm. He considered that during this period students should be paid about Rs. 60 a month, as unless they were paid a living wage they would not undergo the course proposed. He admitted that they got only Rs. 60 a month, even when appointed, but added that they received, in addition, travelling and divisional allowances which brought their emoluments to nearly Rs. 100.

1,182. (*Mr. Cobb.*) He admitted that the main reason why district councils were discontented was because they wanted to have the power to select their contractors, which power they had formerly enjoyed. They took a good deal of interest in their own works, and took responsibility when they were allowed to do so. The school work referred to by him, as having been carried out by a member of the board, was given to the member practically as a contractor. He was entrusted with the work and the necessary funds were placed at his disposal. There had, however, been a great waste of money which the district councils had had to make good. They made no difficulties about it, as the member was one of themselves, but stopped the practice of giving work to individual members.

1,183. (*Rai Bahadur Ganga Ram.*) The witness had measured the work on the school when it came to roof level, and had found excesses in the purchase of materials. 40,000 bricks were required, while the number of bricks purchased was 70,000, and there was no satisfactory explanation as to where the rest of the bricks had gone. He reported the matter to the district council, but they took no notice of it. He also made a general report to the Deputy Commissioner who stopped the practice altogether.

1,184. One of the duties of the divisional fund engineer was to make standard plans for the smaller works such as primary schools. He admitted that there were Public Works Department standard plans, but these were on a costly scale, and as a very large number of schools were required the divisional fund engineer prepared his own plans, reducing the cost. These plans were submitted to the district council, who obtained the approval of the sanctioning authority. The Public Works Department plans were good enough, but sometimes a school was required to be built for as small a sum as Rs. 500, and as the demand for education was steadily increasing standard plans were prepared to suit local conditions.

1,185. The rate of 12 per cent. for establishment charges included 4 per cent. for direction.

1,186. He did not know that the system of road maintenance by contract had been tried and had failed, but suggested that even in that case it should be tried again. If the system were adopted he would simply measure and mark the metal collected, and, by going over the roads from time to time, would see that they were kept in condition.

1,187. He passed out from college in 1904 and was for some time supervisor in Amraoti. He doubted whether he would prosper if, with his twelve years' experience, he started work as a contractor. He did not consider that contracting was attractive at the present time.

1,188. He considered that practical training should be given to students, and that some system should be introduced under which marks should be allotted both for practical and theoretical training, the conferring of the degree depending on the aggregate number of marks thus obtained.

1,189. (*Mr. Mackenzie.*) He got an appointment almost immediately after passing out of the college, and had had no previous practical training at the time. He had obtained his practical training during his service, which had been under local boards throughout. At first his duties consisted in constructing small schools, but later on he had been entrusted with larger buildings and had been employed on the maintenance of roads. On coming out of college he knew nothing about machinery. Mechanical engineering was his optional subject at Poona, and although he had learnt some elementary principles while there, he did not know sufficient to be able to apply them in practice.

1,190. With reference to his statement that sub-divisional officers got travelling allowances in addition to pay, which increased their emoluments, he was aware that travelling allowance was not supposed to be a source of income, but when a sub-divisional officer was in charge of a large area he usually made something out of it.

1,191. (*Sir Noel Kershaw.*) With reference to the question whether there was no legislation which prohibited members of district councils and local boards from having any interest in the contracts of these bodies, he explained that the member to whom the construction of the school was entrusted did not take it as a contractor, but was supposed to execute the work under his own supervision as a member of the board acting thus as an agent of the board.

1,192. He stated that the rates for divisional local fund works were practically identical with the Public Works Department rates, and that the actual cost of construction was also about the same.

The HON'BLE RAO BAHADUR K. G. DAMLE, B.A., LL.B., Vice-Chairman, District Board, Akola.

Written Statement.

1,193. (1.) **Economy and suitability of methods of execution of public works.**—Not being in direct contact with the working of the Public Works Department, I cannot say whether its present working is as economical as it can possibly be under the present circumstances. Judging, however, from the figures for the last two years for the Central Provinces and Berar, the expenses on the Public Works Department establishment form very nearly 20 per cent. of the total expenditure annually made by that Department on public works. These figures lead to the conclusion that it is excessive, if not extravagant, to spend on mere establishment as much as one-fifth of the total cost. If in the case of a private work estimated to cost Rs. 100 a man is told that he will have to pay Rs. 20 as supervision charges and that he will have further to bear the charges of a contractor's profits, at least 10 per cent., he is practically told that for a payment of Rs. 100 he will get a work executed the value of which is Rs. 70. The man is sure to remark that it is not economical to entrust a work to the Public Works Department.

(2.) The popular prejudices against the extravagant estimates and expenditure of the Public Works Depart-

ment is proverbial and well expressed in common parlance by the expression 'Public Waste Department,' which is used to describe the working of this Department. This popular prejudice may, or may not, be well founded; but the natural question arises why should there grow up such a strong popular prejudice against this Department. Anyhow, it is for the members of that Department dispassionately to come forward and remove this prejudice.

(3.) A private owner will try every nerve to save as much as he possibly can, or to reduce the expenditure to the lowest possible minimum, when he gets a work executed under his direct supervision. He is not inclined to make a liberal estimate for the work he wants to get done. He will actually see the work while it is in progress and after satisfying himself that everything is economically and well done, will pay for the work. He will carefully examine each item of expenditure estimated for and will see that each item is carried out in the best possible manner and at a cheap price. He will be scrupulously anxious to secure economy, because the money goes out of his pocket directly. The same amount of over-scrupulousness in the framing of an estimate cannot possibly be expected from his servant.

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however diligent and faithful he may be, because he will not have the penitent heart to feel the loss when his pocket is not touched in the least. The estimates, therefore, prepared by the Public Works Department must, in the nature of things, be presumed to be liberal to some extent. In drawing up a standard schedule of rates a fairly large margin is necessarily allowed for the contractor's profits. In fact, where there is no natural incentive to exert and go about finding where the same material can be secured or the same work executed most cheaply, the tendency is to avoid going into greater details and to fix an arbitrary mean as a suitable measure for calculation.

(4). In the case of district board works, I have found that contractors readily come forward for certain classes of works, but are very reluctant to take up others. For building works they very often express reluctance, saying that the rates usually provided do not lead to a profitable working. In the case of works which they readily undertake the inquiry shows that the rates provided for them leave an attractive margin of profit to them. This partiality for a certain class of works on the part of contractors shows the unsatisfactory preparation of the schedule of rates. If the schedule of rates drawn up by the Public Works Department were worked up with a scientific accuracy, and the differences due to varying local conditions were accurately measured and incorporated in such scheduled rates, there would be no valid reason for contractors fighting shy of one class of works and eagerly jumping at another.

(5). In spite of this obvious and inherent elasticity in its compilation, the schedule of rates is largely followed both by the district boards and the Public Works Department, with the natural result that honest contractors have to lose in certain classes of work and to gain in others. This encourages bad working. As contractors cannot afford to lose, their works cannot be up to the mark. Such works as they do have to be passed as a matter of course. These observations are intended only to point out that it is extremely necessary that a strong committee of professional experts may be asked to examine the position and to lay down a schedule of rates for general guidance. After this is done, there should be one independent itinerant officer for a province to make constant personal inquiries in different localities and to suggest alterations in the rates from time to time and from district to district.

1,194. (II.) **Encouragement of other agency.**—I have been continuously working as Vice-chairman, District Board, Akola (Berar) since 1903, and worked as Honorary Secretary, Akola Municipality, for about six years before that. My experience, therefore, of the working of the Public Works Department is extremely limited, being confined only to such works as were transferred for execution to that Department under the rules in force for district board works. The works usually got done by the local bodies, through that Department, being quite simple in character and cheap in cost, as compared with the government works, the experience I gained from the works executed for local bodies by this department is naturally bound to lack in extent and variety. But having had to control a local fund public works staff, which consists of sub-overseers, overseers and supervisor, the last of them possessing qualifications equal to those of the members of the upper subordinate establishment of the Public Works Department, whose methods of working are also regulated by the system and rules in force in the Public Works Department, I think I have had sufficient opportunities to form an opinion on some of the points falling within the scope of the inquiry entrusted to this Committee by the Government of India.

(2). I wish to offer my experience, with special reference to the suggestion which urges that much greater use can be made by government of local bodies who, at present, employ a skilled public works agency and then to offer such general remarks as I wish to make on a few other points covered by the inquiry.

(3). The local fund public works staff entertained by the Akola District Board, consists of (1) a local fund supervisor getting a pay rising from Rs. 150 to Rs. 350 per mensem, (2) three overseers whose salaries range between Rs. 60 and Rs. 100, (3) eleven sub-overseers whose pay varies between Rs. 40 and Rs. 60. Each member of the staff gets a fixed conveyance allowance and travelling allowance according to the Civil Service Regulations. The annual average expenditure on works executed by this staff is Rs. 1,70,000 in round figures. The nature of works usually done by them is very simple e.g., school buildings, *sergis*, *chaukis*, bazaar sheds and cattle-pounds, veterinary dispensaries, board offices sinking or deepening of wells, construction of roads and causeways, maintenance of roads and general repairs to existing board works. Professional check and supervision over all district board works in Berar are exercised by a local fund divisional engineer, whose pay ranges between Rs. 400 and Rs. 600 per month. For each *taluk*, there is a *taluk* board constituted which works under the control of the district board. Each *taluk* board has its sub-overseer, who executes works costing under Rs. 200, and such works above Rs. 200 and below Rs. 500 as are entrusted to him by the district board. The sub-overseer's works are checked and supervised by overseers, who are in their turn controlled by a local fund supervisor.

(4). In the case of buildings, ordinarily the same kind of work, but of a greater magnitude, is done by the Public Works Department in the district. The Executive Engineer's charge of buildings ordinarily covers government buildings and roads in a district, and these buildings are the Deputy Commissioner's court, different offices, civil courts buildings, high school and anglo-vernacular school buildings, dispensaries, police and forest offices, quarters for government servants and the like. The construction of roads often involves bridges, culverts and causeways. The architectural value of the two sets of buildings—one executed by the Public Works Department and the other by the local fund public works staff is practically the same, under ordinary circumstances. If a district board school contains small dimensions of structure, the anglo-vernacular or high school contains very much the same kind of structure, but of greater dimensions. A mere increase in lengths, breadths and heights makes no material difference in the quality or order of a work. The actual execution of these large works in the Public Works Department is done exactly by officers who rank equally with the members of the district board local fund public works staff. There are standard plans and specifications for many buildings in both the departments, and in cases where variations are required, a proper scrutiny is exercised in both the departments. In fact the procedure adopted in both the departments, for the execution of works, is identical. All things being thus equal, the government can very well exercise economy by entrusting to the district boards many of its simple works, large as well as small. In my opinion, it is possible for the government to reduce much of the Public Works staff in this way.

(5). In the case of government buildings to be executed in a given district, the simplest way I could suggest would be for the government Public Works staff to design and plan out these buildings, wherever no standard designs would suit, and leave the execution work to the district board local fund public works staff, which would prepare the necessary estimates. These estimates may be scrutinised by the Public Works Department. Once the estimate so prepared and scrutinised is duly approved, and the amount of estimate sanctioned and allotted to the district board, the matter of execution should devolve on the district board local fund staff. Ordinarily, large government buildings, the construction of which would require professional skill and control of a higher type than that possessed and exercised by the district board local fund public works staff, are very rare. Such government buildings as require extraordinary skill, or supervision, may continue to be done by the Public Works Department.

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(6). The case of repairs to existing buildings stands, however, on a different footing, ordinarily speaking, they call for no extra or special skill. Ordinarily these repairs consist of (1) lime plaster, (2) colour-wash, (3) cementing, (4) oiling, (5) replacing panes, doogs, shutters or windows, (6), turning tiles, and other similar minor patch works.

(7). For the execution of these repairs, supervision of a highly paid staff of engineers is certainly not wanted. Now that, in Berar, a competent and qualified staff of sufficient strength is actually employed by the district boards to execute such kinds of works, it is certainly profitable and necessary that full advantage of this local staff should be taken for the execution of government buildings. It is quite possible to suggest a suitable scheme for transfer of works in this direction, without incurring any danger of deterioration in quality of works which would be carried out. The quality of work will not suffer. The Public Works Department will be considerably relieved, and its time and attention better utilized for higher and intrinsically much superior kinds of public works, and the district boards will greatly benefit by the proposed transfer.

(8). (a). The one great advantage to the district board local fund public works staff from this transfer of government buildings will be that it will have many more opportunities afforded to it for executing a variety of works, big and small, than it at present possesses. Given greater opportunities for practical work, the staff will have more occasions to apply its theoretical knowledge to practical working, will keep up its efficiency and will make its way for still greater efficiency by showing better work. The district board works, at present, are comparatively few, and hence their opportunities to do building works are also few. At present, it is the complaint of many, that being unused to do a variety of works, they have unlearned what they were taught in the schools. By the suggested transfer of works, the district board can supply a good amount of work to their staff for the application of their book knowledge to practical work to acquire efficiency.

(b). From the district board point of view, they have on hand small works, scattered over wide areas, at places beyond easy access, where building material and ordinary manual labour are difficult to obtain. Transport of materials in small quantities across rough country roads to distant places, far in the interior, is one great difficulty which requires to be overcome. The cost of building is comparatively so small, the worry and trouble involved in personal supervision is so great and the carriage of material is so expensive, that there is very little margin of profit which can induce a contractor to undertake ordinary district board works. The paucity of substantial works is, therefore, one of the reasons why the district boards cannot readily command contractors. Many young and intelligent subordinates are dissipating their energy and wasting their time in arranging for details in execution of small works, which have properly to be attended to by ordinary *mistris*, on petty remuneration. In other words, the staff employed by the district boards does require a higher kind, and a greater amount, of work than they are put on at present.

(9). There being no sufficient inducement offered by the district board for profitable working, no body of local contractors can possibly grow up. There is hardly any appreciable scope for competition, and consequently the staff has often to do largely what it is really for a contractor to do. By the proposed transfer of government buildings for execution to the district board agency, the field of work will be largely enlarged, stronger inducements can be offered and a body of contractors will naturally spring up, much more room will be created for competition and in a short space of time a class of trained contractors and trained workmen will become available. The district board within its limited area will have then sufficient means placed at its command, in its humble way to stimulate private enterprise and to create and foster local industry.

(10). I am positive that if the proposed transfer of works be given a fair trial, the government works will

be well done and the government will save considerably on establishment. In my opinion, therefore, time has come now for the government safely to transfer a large portion of its building work to the district board agency, under necessary and proper restrictions. What these restrictions should be it is not necessary for me to state here. Those are details which can be worked out later on, by both the departments. All that I feel constrained to observe is, that it is quite possible for the government, and that the government would be taking a right step to devise a scheme for the transfer of many of its building works to the district board agency.

(11). Although I recommend the transfer of many ordinary government building works in a district to the district board agency, I do see the necessity of leaving to the government some measure of power of inspection and checking. By the proposed transfer, the people of the district, whose representatives control the district board affairs, will virtually be taken into active confidence, and their sympathies and co-operation will be secured to a great extent in the administration of expenditure on works of public utility, and such direct association of the popular element in one important administrative branch will materially add to the moral strength and popularity of district administration.

(12). In the case of roads, the above remarks will find greater support. The most important and technically difficult part in the construction of roads is their alignment, drawing and specifications. This should be done by the Public Works Department. Once that is done the district board agency should be resorted to, in the usual way, for the actual execution of road works. The technically difficult and otherwise important part in the construction of roads being thus controlled and managed by the superior officers of the Public Works Department, there remains very little in road making that need bother the attention and occupy the time of the highly-paid staff of the Public Works Department. Road making in this latter stage, and its annual maintenance, can be safely entrusted to the district board agency.

(13). In the case of original works, both of buildings and roads, I have so far defined at what stage the government can safely delegate execution to the district board agency. In the case of repairs, however, I see no necessity of the Public Works Department attending to it. Repairs to buildings and repairs to roads call for no extra skill. They form part of the ordinary routine, and can be well managed by the district boards. Considering the annual enormous expenditure incurred by the government on original works and repairs in the Buildings and Roads Branch of the Public Works Department, and the heavy establishment charges borne for this expenditure, it certainly seems necessary that a large saving should be effected by the government in this direction.

(14). The following table shows the expenditure on original works and repairs:—

Year.	ORIGINAL.		REPAIRS.	
	Buildings.	Roads.	Buildings.	Roads.
	Rs.	Rs.	Rs.	Rs.
1914-15 . . .	4,00,519	2,03,621	1,10,520	4,08,664
1915-16 . . .	4,76,596	2,07,108	1,29,004	3,79,678
TOTAL . . .	8,77,115	4,10,729	2,39,524	7,88,342

The above figures will show to what extent delegation to district board agency will relieve the government, and how far the establishment can be reduced at 20 per cent. To all intents and purposes the highly-paid establishment appears to be wasting its time in getting repairs done to building and roads and in getting buildings constructed.

1,195. (III.) Changes in organization.—To avoid the dissipation of a highly-cultivated intelligence, and the

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unnecessary waste of valuable time and trained labour of the majority of the members of the Public Works Department staff, it seems desirable that a complete reorganization of the Department should take place, and to secure economy, without sacrifice of efficiency, the Department should be recruited in both the superior and lower grades of service as largely as possible from the Indian graduates of engineering. Suitable changes need be introduced in the reorganization scheme. To attract the best local intellect for the engineering profession and for the Department some higher posts should be reserved for the first two or three candidates who top the list of successful candidates at the annual competitive university examination in engineering. Promotion to higher grades and pay should be solely regulated by merit and not by reference to mere length of service.

1,196. (*General.*) So far in dealing with the question of delegation of government works to the district board agency my remarks touch one side only, viz., the economy effected by the government so far as its departmental expenditure is concerned. I shall have to see how far such delegation will affect the pecuniary responsibilities as well as the ability of the district board to bear this extra charge and to maintain an efficient administration.

(2). From the strength of the staff the district board commands at present I believe that, although for the purpose of allocating responsibilities and systematising work the establishment actually employed seems necessary and desirable, the staff does not seem to be giving a fair amount of return for the remunerations they receive. In other words, the staff can still bear a further charge of works without diminishing their efficiency. To occupy their full time and to derive the maximum of benefit from their professionally-trained way of working the district board can, with advantage, ask this staff to do more substantial work. Nevertheless, the staff will have to be further strengthened in proportion to the amount of extra burden imposed on them. Possibly the prospects of remuneration will have to be improved, and if the trial of the proposed scheme of delegation proves successful, and is eventually carried out to the full extent, the district board will very likely have to employ an officer of the rank and pay of an Executive Engineer. The extra cost of a very qualified establishment will, no doubt, be adequately covered by the percentage charges which the government will have to contribute over and above the actual cost price of the works delegated. From a financial point of view as well as from the point of efficiency the district board will not be a loser.

(3). There is one aspect of the situation, herein contemplated, which requires to be rather seriously considered. In the progress of local self-government, where the general cry is for greater expression of the popular voice in the control and administration of local concern, and when the government is also preparing to meet this popular demand by gradually entrusting the administration of local bodies to the care and control of non-official popular representatives, such as by allowing these local bodies to elect their non-official chairmen and to frame their own budgets of revenue and expenditure, etc., we have to consider whether district boards can get, as their chairmen, non-official gentlemen who by virtue of their learning, tact, social standing and personal character will be qualified to control a paid servant of the position and rank of an Executive Engineer. In a district place, we have to look out for such a man from two classes only, from the pleaders' class or from the class of affluent landholders or merchants.

The HON'BLE RAO BAHADUR K. G. DAMLE called and examined.

1,197. (*President.*) The witness stated that he was Vice-chairman of the Akola District Board, and had held that office since 1903. The Deputy Commissioner was *ex-officio* chairman of the board.

1,198. The executive charge of the district board was in the hands of the vice-chairman, who practically con-

The latter class stands on a very low level in point of education, and the lofty sentiments of public duties and the corresponding sense of its heavy responsibilities are not yet visible in this class, at least to that extent to which they should exist in a non-official chairman. As regards the class of pleaders, they do possess the requisite amount of learning, and can acquire the requisite social status, and can display tact and excellence in the method of working. In the progress of time, however, at a district place, the professional income of a pleader, owing to competition which is growing keener and keener every day, and owing to the harder struggle he has to make for his existence, and for the satisfaction of his ever-increasing ambitions, is bound to decrease. In fact there would be no surprise if the person at the head of the district board was a gentleman getting a monthly professional earning far below the monthly salary of an Executive Engineer whom he was called upon to control. In practical working this apparent incongruity would appear to be a serious impediment to an efficient administration of the local body. This practical objection pre-supposes that the virtue of integrity and the strength of character which can command respect and obedience are the attendants of riches or opulence. Personally, I am not of such an opinion. There are many noble exceptions to this practical remark. Persons can be found who can worthily fill the office of a non-official chairman although their financial status might not be as great as that of the subordinates whom they are asked to control. The difficulty, if it be ever presented in its acute form, can be best got over by the district officers intervening, to guide the local bodies in making a proper selection of their chairman. There is no reason, again, why the non-official chairman who is annually to be elected should not be paid a decent honorarium for the responsible work imposed on him.

(4). There is one more question which is likely to arise and it is this. Will the non-official chairman ever care to inspect so many scattered works controlled by a highly-paid subordinate, and will not such delegation result in unduly strengthening the hand of the subordinate who will practically run the district board administration? To this I may suggest a remedy. Non-official members are busy in their own ways, and are not expected to undergo the necessary personal trouble and expenses for inspection duty. Time is valuable to them. In such a case, the most effective remedy is to place facilities of conveyance at their disposal. Free motor service to non-official members will save their time and enable them to move out and inspect work. In other words, means can be found to make non-officials move out and exercise a real check on the working of the highly-paid subordinates.

(5). I advocate the delegation of works to the district board agency, even though I appreciate the force of the objections pointed out above. These difficulties have to be faced, and the people have to be trained in the art of administering their own public affairs. So far then I have dealt with the question of delegation of government works to the district board agency, and have deliberately advocated such delegation, fully convinced, as I am, that such a step will eventually prove greatly economical to the government, and largely beneficial to the local bodies concerned. It is not possible for me sharply to define the manner and extent of reduction that can very likely be effected in the Public Works staff wherever such delegation is possible, on account of the district board possessing a qualified staff to undertake the government works. I merely express, as my opinion, that some reduction is possible in the Public Works Department in the way aforesaid.

trolled the whole of its administration. The Deputy Commissioner only checked and inspected works, and presided at meetings of the board, and occasionally any points upon which orders were desired were referred to him. The witness suggested that the chairman might be a non-official member of the board, and that the

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Deputy Commissioner need no longer have any control over its affairs. He would turn the vice-chairman into a sort of executive officer who would be a whole-time paid servant of the district board, at any rate in the case of those boards who could afford it. If, however, a special officer could not be obtained for this post, an honorarium might be paid to compensate the holder for the labour and time involved. He also suggested that, in connection with inspections, non-official members should be provided either with a free motor service or with their travelling expenses. The former method, he considered, would be the more effective remedy and would save valuable time.

1,199. Works erected by the district board were cheaper than those erected by the Public Works Department because, from the figures worked out by his Secretary, he found that the establishment charges of the latter amounted to 20 per cent., whereas the district board charges amounted to between 12 and 15 per cent. It was, however, pointed out to the witness that the establishment charges of the Public Works Department amounted only to about 15 or 16 per cent., so that there was very little difference between the two. The rates paid by the Public Works Department and by the district board, were about the same.

1,200. The district board maintained a larger staff than was really necessary. It could not, however, be reduced as under the new scheme the *taluka* boards were independent, and were required to maintain a sub-overseer, although there was not really enough work for that officer. The local fund public works staff entertained by the Akola District Board consisted at present of a local fund supervisor whose pay was Rs. 150 rising to Rs. 350 a month, three overseers whose pay ranged between Rs. 60 and Rs. 100 a month, and eleven sub-overseers, i. e., six for the *taluka* boards, and five for the district board, whose pay varied between Rs. 40 and Rs. 60 a month. The whole cost of this establishment worked out to about 15 per cent. of the cost of works.

1,201. The sanction of the Commissioner was required to the appointment of the Secretary and any person on the local fund public works staff. This sanction was required, both to the creation of such an appointment, and to the actual man selected to fill it. Thus, the sanction of the Commissioner might have to be obtained to the appointment of a sub-overseer. In Berar, government had power to suspend the district board if the latter proved inefficient.

1,202. He advocated that government should transfer the construction and maintenance of all roads and buildings, with the exception of some of the more important works, to the district board, government preparing the designs of the buildings and leaving the construction entirely to the district board, supplying the latter with the necessary funds. As to what government control would be required, should such a scheme be contemplated, he thought that the appointment of the divisional engineer should be approved by the Commissioner, or by some professional man, e.g., the Superintending Engineer and that government should further have the power to inspect and check works. He agreed with the suggestion that, if government after having inspected works considered that the district engineer was incompetent, they should have the power to dismiss him. He had not thought out the matter definitely, but agreed that if government, after an inspection, found that a considerable amount of money had been wasted by the district board or boards, they must have some power of control, since the amount of government money spent by these boards would be proportionately large. If the district boards did not spend their money efficiently, he suggested that government might perhaps take over the management of the works temporarily, or insist on the appointment of a separate officer for their execution, who would see that expenditure was properly incurred. The salary of this separate officer would then be paid by the district board. He did not think it would be possible, if it were proved that money had been wasted by the district board, to hold the members of the board personally responsible; nor did he think it would be

satisfactory if, supposing government had given a certain sum for the maintenance of its own buildings and this money had been wasted by the district board, government had the power to require that amount to be set aside by the board by curtailing expenditure under some other head.

1,203. He thought it would have a good educative effect on the district board local fund public works staff, if, as he had advocated, certain government buildings were transferred to the local board. He considered that, so far at least as Berar was concerned, the district boards had reached the stage at which they might be entrusted, not only with the execution of their own works, but also with that of government works. He did not agree with the suggestion that members of district boards should take over and supervise the construction of buildings instead of handing them over to the district board staff. These members, as a rule, were not professional men and could not be expected to exercise proper supervision; it would be possible to trust them to see that the work was going on properly, but the local fund staff would have to exercise the necessary professional supervision.

1,204. With reference to the proposal that the construction of schools and wells, instead of being carried out through the district board staff, should be handed over to *malguars*, he explained that pettyworks costing Rs. 50, and less, were already entrusted to the villagers, but that works costing over Rs. 50 were generally executed by contract. He thought that villagers were quite capable of carrying out works costing less than Rs. 50 and suggested that small works of the value of Rs. 50 to Rs. 100 might also be executed by them, but he would not yet go beyond the latter figure as, in his opinion, they were not at present prepared to execute works the cost of which exceeded Rs. 100. He thought, however, that if they showed signs of improvement, their powers might be increased.

1,205. Under the scheme outlined by him, the district staff would be responsible for the construction of local board works and also for the construction of government works. As regards supervision, he explained that at the present time the board had a district engineer who was in charge of two districts, but if government works were transferred to the district board, they might each maintain an engineer with a Superintending Engineer to control them. His scheme contemplated a district engineer for each district, and for the professional supervision of these officers a Superintending Engineer, or a selected divisional engineer, in other words, the district board staff would be subject to inspection by an officer of about the status of a Superintending Engineer. As to the latter officer's powers, the witness considered that he should check plans and estimates, and if, on inspecting particular works, he found that the work had not been properly done, he should take those responsible to task and be given power to require the district board to carry it out satisfactorily.

1,206. If alignments, plans, etc., were prepared by government, all roads including main roads should be handed over to the district board for construction and maintenance. This system would be as efficient as the existing one, and would save staff, since the local fund supervisor at present had to travel throughout his district and, as he went from one place to another, he could without difficulty inspect government as well as district board works.

1,207. It was his experience that the theoretical training of the existing establishment employed by the district boards, was really higher than was necessary for the class of work they had to perform. So far, the district board had been called upon to execute only the smaller class of works, and the subordinate staff obtained for this purpose were mostly men who had passed the upper subordinate examination. *Mistris* could not do the work of these subordinates, as they had no theoretical knowledge; they were only of use in exacting work from labourers. He thought, however, that these upper subordinates should be given the class of work for which they were intended. The district board works requiring the

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attention of upper subordinates were at present so very few that their appointments were not justified, and the maximum benefit was hence not derived from them. In Berar, the system of a combined cadre for engineering appointments was still in force and worked satisfactorily. There was no friction between district boards in connection with appointments, as these appointments were in the hands of the Commissioner and the board had nothing to do with them. Asked whether this position was satisfactory to the board, he stated that it would do at the beginning, at any rate, and that the boards would have to be content with this state of things. The advantages of the combined cadre were so great that, instead of the individual, the local board should be sacrificed.

1,208. (*Sir Noel Kershaw.*) The alignments, drawings and specifications of new roads would, if the system advocated by him were put into force, be undertaken by the Public Works Department, and some of the more important works would also be left to government agency. In the case of the construction of a bridge, for example, a Superintending Engineer would have to draw up the design. He did not know whether the number of these officers would have to be increased, as he was not conversant with the practical working of the Public Works Department, nor could he say whether the drawing up of plans and specifications would occupy the whole time of such an officer.

1,209. (*Mr. Mackenzie.*) The local fund supervisors were not in a position, he thought, to prepare their own schedules of rates; the Public Works Department schedules were far better. The only objection to the Public Works Department schedule was that contractors always showed preference for certain items from which

he inferred that in some other cases the rates were too low.

1,210. (*Rai Bahadur Ganga Ram.*) It would not, he thought, be possible to make the chairman of the district board responsible for government money which had been wasted by that body.

1,211. The 12 to 15 per cent. establishment charges of the district board included supervision, and the board's share of the divisional local fund engineer. It did not include any share of the Superintending and Chief Engineer. It was pointed out to him that direction and supervision cost 4 per cent., and that if this amount were added to the district board's 15 per cent., there would be no saving. He had built a house of his own, a portion of the construction of which had been done by a contractor, and a portion by departmental agency. The establishment charges had been very small—about Rs. 200 a year. The cost of the building, which had been designed by a friend, a local fund engineer, amounted to about Rs. 30,000.

1,212. (*Mr. Cobb.*) The members of the Akola District Board took an interest in their local works, and were quite willing to give their time and energy without payment. The witness added that this should be the spirit also in other parts of the province.

1,213. (*Mr. Durie.*) If the Public Works Department did any work for the district board, a percentage of 1½ was charged.

1,214. (*Rai Bahadur Ganga Ram.*) The non-official vice-chairman of the district boards were practically all pleaders; there was, however, a gentleman of the medical profession on the Amraoti board.

The Hon'ble RAO BAHADUR N. K. KELKAR, President of the Balaghat Municipality.

Written Statement.

1,215. Before I proceed to place my views on some of the points before this Committee, let me submit humbly that it was with undue haste that witnesses were required to read in their written evidence. If a fortnight's time is needed by the Committee composed of expert and experienced men to study the evidence of witnesses, a witness whether belonging to the Department or a stranger would require much longer time for study, to be able to place before the Committee anything approaching intelligent views. Although this Committee was notified in November last, and general public opinion or criticism was invited, it is generally understood that those that are selected or nominated by the local Government are alone examined verbally before such Committees. In consequence of this prevailing impression very few volunteer their evidence. Within such a short notice, I believe, even engineers and others who have been closely associated with the Department would find it difficult to write an elaborate or comprehensive note. It must be much more difficult for a man like me who has spent his life in the legal profession, which is innocent of the technicalities of the engineering department. My only object in making this complaint in the beginning of my evidence is to point out that evidence required within such a short notice is not likely to be of much use to the Committee, or may even fail to place all aspects before it. I may make it clear that I have made these remarks in the interest of the Department, which, justly or unjustly, is described in ordinary or loose parlance as a public waste department. There can be no two minds that there is much in the Department which is capable of improvement. At the same time it must be recognized that looking to its importance it cannot be dispensed with. A department which is victim to notorious hostility and prejudice on the part of the public deserves more patient trial.

1,216. It may be noted that the public at large are still unable to understand the precise object of appointing this Committee at the present moment. Economy would to a large extent depend upon the recommendations of the Public Services Commission which are anxiously awaited. We are not certain which of their recommend-

ations are likely to be accepted. However, I hope that the deliberations of this Committee would help the government in deciding which of the recommendations of the Public Services Commission should be accepted.

1,217. I have never been in the service of this Department, nor have I ever worked as a contractor under it. My only claim to appear in the witness chair before this Committee is that I have been associated with the affairs of the municipality and district council of Balaghat since more than 20 years, and on several occasions I have conducted civil suits arising out of Public Works Department contracts of large values. The Balaghat Municipality is one of the poorest municipalities in the province, and does not on an average spend more than Rs. 1,500 annually on public works, both construction and repairs or maintenance. The Balaghat District Council is richer than the Balaghat Municipality, but as compared with some of the other district councils in the provinces it is poor. On an average, now-a-days, it does not spend more than Rs. 45,000 on all sorts of works, and before the transfer of some of the district roads to that body it spent a much less sum on such works. In addition to this, I have been watching, with interest, the methods of this Department since long. These, if any, are my qualifications for being a witness before this Committee. Having said so much about my qualifications, I shall now proceed to answer to the best of my ability and information some of the questions which are at issue before this Committee.

1,218. The Public Works Department seems to be a well-organized department and has done and is doing useful service in developing the country. In the organization and methods of this Department it strikes one that economy, without prejudice to efficiency, is possible, and one wonders why is it that so long no attempt was made in that direction. Economy is possible, or rather undue expenditure is visible even to a layman, in two items—firstly, establishment; and, secondly, repairs or maintenance. The excess expenditure is markedly visible in the case of maintenance under communications. To illustrate this I take the figures for the last three years only, viz., 1914-15, 1915-16 and 1916-17. I take the actuals for the first year, and the budget estimates

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for the latter two. Original works and repairs in the first year cost in round numbers Rs. 61,67,500 as against establishment charges amounting to Rs. 10,19,000 and odd, equivalent to 16.94 per cent. on the outlay. In 1915-16 the total outlay and establishment charges were estimated at Rs. 52,45,000 and Rs. 10,30,000 respectively, i.e., the establishment charges were 19.64 per cent. on the outlay. In 1916-17 the establishment charges are estimated to cost 24.36 on the outlay as follows: outlay Rs. 42,70,000; establishment Rs. 10,40,000. The above figures represent the provincial works only. If we put imperial and provincial together, we find that in the first two years the percentages are slightly in excess and in the last year it was slightly below the provincial averages. To these establishment charges we have to add the works establishment charges which are generally debited to particular works. I have not been able to find these figures, and cannot say if the charges are enormous or otherwise. These figures lead one to think that the establishment charges are out of proportion to the programme of works as judged by the total outlay.

1,219. The establishment charges are divided into two heads "direction and supervision" and "execution." In a year like 1915-16 the former, I believe, approximate about 6 per cent. and the latter 13 per cent. or so. In my opinion, with proper decentralization and reorganization of the Department, charges under the former head may be saved and those under the latter can be reduced. Roughly speaking, according to my scheme, the establishment charges may be reduced by 25 to 30 per cent., and, if the contractor's agency is substituted for departmental work, further reduction is possible.

1,220. The Chief Engineer and the two Superintending Engineers with their staff, etc., are responsible for the direction and supervision charges. Their duties, though specified in the rules or orders scattered here and there, are not quite clear to the public, and it is difficult to understand why, having regard to the nature of the works that are generally constructed in these provinces, in the name of direction and supervision such a costly agency or any agency at all is necessary, leaving aside the charges on account of the Sanitary Engineer and his staff, which are included under the head "direction." The Chief and the Superintending Engineers appropriate between themselves nearly 33 per cent. of the total expenditure on establishment. What direction and supervision on their part is necessary to justify such an enormous expenditure? Buildings like council chamber, post office, laboratories, university, etc., must be few and far between. I believe that the Chief Engineer or the Superintending Engineers are not architectural experts, and the Government of India's Consulting Architect is invariably consulted for works requiring architectural skill. For such buildings a special expert may, if necessary, be employed and his charges debited to that particular work. But this tremendous recurring expenditure in the name of direction or supervision can on no account be justified. On going through the statements appended to the final issues of the budget estimates, I find that the buildings constructed are generally used for residential purposes or for office and schools, and as such do not require much engineering talent. I understand that for most of these buildings standard plans are prepared, and with certain modifications suited to local conditions they are constructed very nearly in accordance with these plans. If, however, for any class of buildings standard plans are not prepared they may be prepared and kept in readiness for reference. What direction is either needed, or can be expected from such high-paid officers? Most of the direction, if any, given by these officers must be paper direction given from the desk, from within the four walls of the office chamber at the headquarters. For such direction they must to a large extent depend upon the reports received by them from their local subordinates. It is impossible for them to inspect, indeed it would be waste of power to expect them to inspect, all such works. Without personal or local inspection direction must be nominal, or at any rate must be of such a nature that it can be dispensed with.

1,221. The same remarks may apply to the construction of roads. On going through the statements above referred to, I have come to the conclusion that the construction of roads, including bridges and culverts, is not so very difficult, and ordinarily should not require so much engineering skill as to justify such a costly direction at the top. Even with such costly direction we find that the buildings are often cracked or leaking within a few days or months after construction. Their repairs have to be undertaken comparatively early. Bridges or ancients costing several thousands have been washed away. I do not think such instances would have been innumerable in the absence of such direction. From such experience as I possess, I am strongly inclined to the view that the stability of any work depends principally on the honesty, business habits, skill and tact and, above all, industrious habits of the local subordinates.

1,222. There, however, we find that many of them are low-paid and others, though in receipt of substantial salaries, are either unqualified or inexperienced. Speaking in the interest of economy, and without in the least intending to foster racial feelings, I think, in a spending department like this, Indian staff would be more efficient and suitable. In the first place Indian staff is less costly; in the second place, as the works are executed by Indian labour or Indian contractors, Indian officers are better understood and controlled by their countrymen. An Indian officer can detect any fraud or corruption among his countrymen more quickly and easily than any officer belonging to other race possessing generally insufficient knowledge of the vernaculars and innocent of the trade tricks which are used in such business. It is probably on this account that some of the Indian contractors, of course selfish, are found praising a European officer in preference to an Indian.

1,223. I am afraid I have diverted a bit from my main point. To come to that again, I have dealt with the original works, roads and buildings. I shall now turn to maintenance and repairs. I understand that the direction charges are or ought to be debited to or spread over these works also. Large sums are annually spent on the repairs of buildings and maintenance of roads. In some years they are about half the amount spent on original works; in some nearly two-thirds, and in others approximately equal. Nearly one-fifth or one-sixth of this amount is spent on the repairs of buildings and the rest on the maintenance of roads. I have not been able to find out how much in each case is spent on ordinary and how much on special repairs. Presumably, ordinary repairs or maintenance must be absorbing a very large bite. Here again the public are unable to see the necessity for direction for such repairs or maintenance as we every day see done to buildings or roads.

1,224. I am not an expert. I do not mean to imply that direction is absolutely unnecessary; but we have to look to the nature of the works. In any case, I believe that the proportion of direction charges is comparatively too large. The general complaint or criticism against the direction officers is that the procedure is elaborate and is responsible for so much red-tapism and delay. Looking to the figures for the last two or three years one is inclined to subscribe to these criticisms. The direction officers spend annually from Rs. 25,000 to Rs. 28,000 for contingencies, and the subordinate ones between Rs. 36,000 to Rs. 42,000. A good deal of time must have been spent in correspondence and returns, much of which, I fancy, may be unnecessary or can be avoided. It is probably on this account that we often notice delays either in undertaking or starting works.

1,225. For reasons not known to me irrigation is excluded from the scope of the inquiry entrusted to this Committee. For my purpose I think it necessary to refer to this branch. I have attempted to show above that, having regard to the fact that most of the works are standardized and with regard to others standardization is possible, and that the works are not of an extraordinary nature, and those of such a nature being few and far between, direction is either unnecessary or may be merely formal. In any event it can be entrusted to

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the Irrigation Branch without adding any material burden on that branch.

1,226. I have gained an impression, from the perusal of the Public Works Department Manual of Orders, that the powers exercised by the Chief Engineer or Superintending Engineer can be delegated to the Executive Engineer. I understand that the Executive Engineers submit cut and dry schemes or projects to these officers for sanction. In many cases their sanction is formal, and in others the alterations or modifications made by them are not very significant. The point I place before the Committee for consideration is whether, with proper decentralization, it is not possible to abolish or minimize considerably the direction charges. Subject to standard plans and administrative sanction, I do not see why the Executive Engineers, at least the senior ones, whose knowledge and experience are for all practical purposes precisely the same as those of the Chief or the Superintending Engineer, should not be invested with powers and functions at present entrusted to the latter kind of officers. In support of this I may cite Rule 63 at page 203, part III, Central Provinces Gazette, relating to the powers of the divisional local fund engineer. If in the matter of appointments and appeals against unjust treatment of subordinates or for other administrative purposes, a central agency is needed, one of the Secretaries to the local Administration may be able to do it, or if a man with engineering talent or experience is needed the amalgamation of this branch with the Irrigation one may be suitable.

1,227. I have already stated above that I have never worked under this Department in any capacity. With the limited time at my disposal I could not place before the Committee other details. From all I know I am convinced that the question of either altogether doing away with or minimising the direction charges is one that deserves serious consideration on the part of this Committee. It has become now a topic of public criticism. Economy under this head would do a great deal in saving large sums of public money and would also economise public time.

1,228. I am told that the requirements of each revenue division, and the allotments to be made to it, are duly considered and provisionally settled at the annual conferences of the Commissioners. Executive Engineers can give adequate advice to the Commissioner in this matter. This co-ordination between the revenue officers and the engineers has a great bearing upon the question which I have taken the liberty to place before this Committee. Before closing my remarks on this point I may mention that officers are not promoted to the Executive Engineer's grade, and allowed to hold independent charge of divisions, unless they have put in at least ten or eleven years' service. With their education, and so much experience, I believe that they ought ordinarily to be able to perform the duties for which at present reference has to be made to the superior officers. Cases may occur in which after the commencement of the work some modifications requiring additional cost may be found necessary. I do not see why, with the combination of his professional skill with the administrative talent of the Commissioner of the division, the Executive Engineer should not be able to deal with the modifications. Except in so far as the pecuniary jurisdictions are concerned, the duties, and I may add even responsibilities of the Executive Engineers and his superiors, seem to be identical. If to a divisional local fund engineer in receipt of a much lower salary more extensive powers in the matter of according professional or technical sanction are under contemplation, it is difficult to understand why an Executive Engineer should not have the same, especially as we often notice that sanction and other work is mostly a matter of routine.

1,229. I have laboured so far only on one branch of the establishment simply to show that even under the existing conditions, and in the absence of trained private agency, economy is possible, provided it is regarded as a watchword. The same principle in my opinion holds good in the case of other establishment under the head "Construction" or "Execution." This consists of

Executive Engineers, sub-divisional officers, and so on. The establishment charges under this head are between 13 to 15 per cent. a year. I have not been able to ascertain what portion of this can be debited to original works and what portion to maintenance and repairs. Under this head I think, with a reorganization, economy is possible. Within the limited time at my disposal I could not sketch out a reorganization scheme. One is under my contemplation, and if possible I shall try to produce it before the Committee in the course of my oral evidence. The rough outline of my scheme is that for engineering purposes the districts and divisions should coincide with revenue districts or divisions. This will reduce the number of sub-divisions and divisions from 40 and 10 to 22 and 5. Though the district engineers will have to be paid more than the sub-divisional officers, reduction of establishment charges on the whole seems possible. Under this scheme there will be proper division of work. Work will be expedited. For want of proper distribution progress is delayed and that causes loss of time and money. Delays in the progress of work and in the payments for work done are to some extent responsible for the higher rates that have to be paid.

1,230. Some engineers would not grudge working under, or in consultation with, the district or divisional revenue officers, though others seem to think that they are and ought to be independent of such revenue officers. Personally, I think that some sort of check on the part of superior revenue officers would tend not only towards economy, but perhaps to efficiency too.

1,231. In the interests of economy, I would suggest that, wherever possible or convenient, the functions or at least some of them which are at present performed by the Roads and Buildings Branch establishment may be transferred to the Irrigation Branch. For instance in the Balaghat district where extensive irrigation works are going on the Irrigation engineers have, in the discharge of their duties connected with irrigation proper, to pass along roads in charge of the Roads and Buildings Branch. Why, simultaneously, should not the Irrigation people be able to supervise the construction or maintenance and repairs of such roads or of the buildings along them? It won't interfere with their ordinary duties or impose on them heavier or arduous duties. In my opinion this suggestion is worth consideration.

1,232. Having shown that economy is possible in establishment I will proceed to show that economy is possible in works also. I shall first of all take up repairs or maintenance. In the earlier part of this note I have specified the sums that are annually spent on them. Except collection of metal and *muram* and perhaps white-washing or so, maintenance and repairs are generally done departmentally. It is in the maintenance or repairs more than in the construction that there is a good deal of leakage and fraud. There supervision is primarily or principally in the hands of low-paid mates or *mistris* or sub-oversers. Supervision by the superior staff is periodical and nominal. The usual methods by which fraud is practised, or leakage are caused, are that the same metal or *muram* is measured and paid for more than once. Adequate work is not exacted from the labour employed and labour shown as employed or public work is really engaged otherwise. These are open secrets. They can be checked or minimised by giving contracts. It should not be difficult to get contractors; maintenance or repairs do not require engineering skill or technical knowledge. If arrangements to let out maintenance and repairs on contract are made 5 to 8 per cent. saving is anticipated. It will not be difficult to get contractors for this work. I do not profess to be competent to point out all details. I have ventured to point out a prominent few. Costly establishment and the dilatory procedure seem to me to be some of the principal causes owing to which we find that the methods are neither economical nor suitable.

1,233. Closely connected with this, or probably with the question as to the employment of other agency is the question to what extent or the construction and repairs or maintenance of what classes of public works should be entrusted to the local bodies. I have

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[Continued.]

from the beginning opposed the divisional local fund engineering scheme. It has had sufficient trial. Ten years' experience has shown that, both from the point of view of decentralization, as well as from any other point of view, the scheme has been a failure. It has in no way increased the responsibilities or powers of the local bodies. An officer, who for all practical purposes can appropriately be described to be a government servant, with his staff, is imposed on the local bodies to execute certain kinds of works. The procedure laid down for the execution of works through this officer is, in substance, the same as laid down for the guidance of the Public Works Department officers. In other words, the local fund engineering scheme is another branch of the Public Works Department. It has strengthened or confirmed the popular belief that the execution of public works is a thing departmentalized, for which private talent has no scope and private enterprise can get a slice of profits only through the mercy of departmental officers. Instead of stimulating private enterprise or even preserving local industry it has just the opposite effect. The old *mistri* class has practically disappeared. The sub-overseers are more theoretical than practical. Even the works which ought to be done through village agency have to be done through this agency. I have not been able to understand why in rural areas village schools, cattle pounds and *sarais* should require the services of a trained engineer of any grade. In my opinion substantial ones with perhaps less cost can be constructed by village *malguzars*. I have seen school buildings constructed years ago by the *malguzars* still serving the purpose for which they were built. For schools, cattle pounds or even for *sarais* we do not require architectural or ornamental buildings. All we want is the sort of buildings in which the villagers ordinarily or usually reside or in which they house their cattle. With such intelligence and education as an average *malguzar* in these provinces possesses, such works and repairs to them can be done by them. I shall have no hesitation in entrusting to the village agency the sinking, construction and repairs of village wells or the planting of groves or trees along public roads or ordinary repairs to roads. Either in the name of efficiency or professional skill, or on account of want of trust in the villagers, no practical or adequate use of the village agency seems to have been made in the execution of many works, which ought to be done by them, but for which under the existing system we have to look to men who have adopted or who have been trained in the western system of engineering. I do not condemn the western system. In the interest of economy and expedition, as well as a matter of practical convenience, I think that the works of the kind specified above will not suffer owing to the absence of such engineering skill. It will stimulate local industry if village agency is utilized in this manner. In the rules recently promulgated the local Government has recognized this principle. Under these rules local agencies can be used for original works or maintenance or repairs not exceeding Rs. 200 in value. That principle may be applied, without restriction, to works mentioned above and extended in case of others as soon as possible. If supervision and advice of an expert or a skilled engineer is needed or sought for, it should be given and in every case care must be taken to avoid red-tapism. Unless an entirely free hand is given to the local bodies in the management of their works, the object the Government of India has in issuing this resolution will never be accomplished.

1,234. In the aforesaid discussion I have assumed that departmental agency is necessary for the execution of public works. In the present state of the provinces this must continue for some time. The time has, however, come when a serious effort ought to be made to transfer to private agency most of the functions which at present are exercised by the Department. In the Department, I would include local bodies also, because in both cases the system is the same, though in one it appears to be less expensive or costly than the other. Neither, however, stimulates private enterprise involving skill, talent or architectural knowledge. •

(2). Except, perhaps, in one or two cases, no attempt to my knowledge has so far been made to encourage or stimulate such enterprise. I say so, notwithstanding the fact that most of the work is executed by private contractors. Only manual work, or labour and materials, are supplied by these contractors, but for everything else they have to be at the mercy of even the lowest paid subordinate of the Department. This is humiliating. The system has created a deep-rooted impression on the public mind that in the execution of public works private agency can play only a subordinate part. Government alone can remove this impression by changing their procedure and system. If government hold out prospects or guarantees to approved contractors, I think capable contractors firms will settle in these provinces at no distant date. All that is required is guarantee of works, at least for a sufficiently long time. We had in these provinces some respectable contractors. Their number is diminishing now. They used to make a decent income out of the Public Works Department contracts. Now the complaint is that respectable people do not come forward to work as contractors. On the other hand it is asserted that this is due to the fact that the treatment the contractors receive from Public Works Department officers is not what it should be. Whatever may be the fact, I believe it would not be difficult to revive confidence in the public mind, and, with government sympathy and goodwill, to have in each district, or in some districts, firms of respectable contractors. Such contractors, firms may be licensed and their private staff of *mistris*, etc., may also be licensed, later on they themselves may be able to engage their skilled staff. I understand that, at present, temporary establishment is engaged to do the survey and other preliminary work. That work could be done by the contract system. The same agency may later on be engaged to execute the work. If this or similar procedure is adopted, economy is bound to follow. If the government really mean to relax the departmentalization of the execution of the public works, there are numerous ways to stimulate private enterprise and thus to economize time and cost. I did not believe in the stock argument that the country, or any part of it, is not ripe for the introduction of a novel system or for the modification of the existing scheme. It will never come if the present system or red-tapism continues. Government must take the lead or initiative.

1,235. Another difficulty which these contractors, professional or otherwise, labour under, is the want of adequate capital to carry on works. Advances from government, at least on a large scale, are perhaps out of the question. However, I believe it is within the bounds of possibility to remove this difficulty by organizing credit co-operative societies of contractors, or of persons for the supply of labour and materials. This is not merely an ideal, but can be converted into a fact. One of the reasons which I have been able to discover as to why public works are costly is that the contractors have to borrow capital at exorbitant or even prohibitive rates of interest. Co-operative organization is the best means for the solution of this difficulty. I know the difficulties in organizing such societies. Though they may not be insurmountable, a thorough preliminary investigation or organization would be indispensable. I have talked this matter over with some engineers and others, and everyone seemed to think that it was a feasible suggestion. If the government takes up this suggestion I believe useful results would follow. Before closing my remarks, I again beg to urge that materials won't be forthcoming unless scope for their use is expanded.

1,236. I may remark that the word decentralization used in the terms of reference is not sufficiently clear. If that word is used to indicate the delegation of powers and functions of superior officers to those of lower grade I need not say more than what I have already said. If however it is meant to indicate the creation of a separate or self-contained department, within the Department, with a separate direction staff and so on, I think it would be objectionable.

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1,237. I have got no personal experience of the matters specified in the terms of reference in regard to education practical training, and the relations of the Public Works Department to other departments, but the general impression is that training is becoming more and more theoretical and it is not as practical as it ought to be. It is noticeable that students from some of the engineering colleges in this country are not fit to take up practical work. If they are taken to works, and made to work there as students in the medical colleges are asked to attend patients, useful results may follow. It would be advisable if some of the departmental works both of construction, repairs or maintenance are entrusted to the colleges or schools for the purpose of imparting practical training to the students. The methods adopted by the Public Works Department to meet the needs of the other departments have improved though complaints are still heard that the progress of works is unduly dilatory and sometimes the construction is unsatisfactory too.

This may be due to the employment of untrained contractors or inexperienced supervising staff; for either I have suggested a remedy.

1,238. The main object of this Committee is to devise means to stimulate private enterprise, which for want of employment or capital is engaged in subordinate service on low-paid salaries. So far as government service is concerned, the method of recruitment is rather destructive to Indian interest. Appointments by selection in preference to those by competitive examinations are not likely to be conducive to Indian interests. The only other alternative is to entrust the execution of the works and the preliminary surveys, plans, estimates, etc., to the *bonâ fide* Indians. As far as possible competition between Indian and European firms should be discouraged and preference should invariably be given to Indians. Unless that is kept in view the objects of this Committee will not be realized or fulfilled.

The HON'BLE RAO BAHADUR N. K. KELKAR called and examined.

1,239. (President.) The witness stated that he was the President of the Municipality of Balaghat, and that he had held the post for some years. For the past three years he had also been a member of the district council.

1,240. Considering the class of work the Public Works Department were called upon to perform, he was of opinion that their direction staff was too large and that consequently the charges for direction were capable of reduction. The officers included under the head 'Direction' were the Chief Engineer and the two Superintending Engineers, and this staff he considered to be unnecessarily costly. He suggested that one officer of the rank of Superintending Engineer, whose salary would be between Rs. 1,750 and Rs. 2,000 and who would be Secretary to the local Administration and act as the connecting link between the administration and the subordinate staff of the Public Works Department, would be quite sufficient for the whole province. Whether this officer could exercise sufficient supervision over the province depended mainly upon the nature of the supervision. Laymen like himself were generally under the impression that a Superintending Engineer's work was mainly confined to the office, and his district was only very occasionally visited by such an officer. He did not know what amount of time a Superintending Engineer spent on tour, but some idea could be obtained from the travelling allowance drawn by that officer as shown in the budget. There were many works which it was unnecessary for the Superintending Engineer to visit. He thought that the Executive Engineer ought to be able to carry out all the work in a district, without the detailed supervision now exercised over him by the Superintending Engineer.

1,241. He suggested that the Irrigation and Buildings and Roads Branches should be combined, wherever possible. With the exception of places where specialization was really necessary, he was opposed to the view that there should be more specialization in the Department. For ordinary roads, such as existed in the Balaghat district, very little specialization was necessary, and the same remark applied to the class of buildings found in the ordinary district.

1,242. Not only the direction, but also the executive staff of the Public Works Department, was too large; and the scheme he favoured for reducing the cost of works was that which had been suggested by two previous witnesses, namely, district schemes with an Executive Engineer for each division. He had drafted out a rough forecast and, according to his estimate, the total cost amounted to Rs. 6,96,600. He went on to explain that there were twenty-two districts in the Central Provinces and Berar, and hence twenty-two district engineers would be necessary, six being of the first-class, ten of the second-class and six of the third-class. The pay of the first-class engineers would range between Rs. 600 and Rs. 700, that of the second-class between Rs. 400 and Rs. 500 and that of the third-class between Rs. 250 and Rs. 350. The cost of the first six district engineers would be 6×850 (including travelling allowance) $\times 12 =$

Rs. 61,200 a month. For the supervision of these district engineers there would be five Executive Engineers—one for each division—whose pay would average Rs. 1,300 a month. Above the Executive Engineers would be a Superintending Engineer, who would also be Secretary to the local Administration, on a salary of Rs. 1,750 to Rs. 2,000. Whether these district engineers would be under the control of the district bodies depended on how far the powers of these bodies were to be extended. If it were contemplated that the district engineer should be in the same position as the present divisional fund engineer, he would give no extra powers to the district board, but if these engineers were to be placed under the local bodies for administrative purposes, then he would certainly be in favour of giving those bodies complete control of them. If, however, municipalities were to be included among the district bodies, he was not in favour of the delegation and would give the power only to the district council.

1,243. He would view with approval, a system under which all public works in a district, including both government and local works, would be managed by a board of works who would employ such staff as they considered necessary. On it being pointed out to him that one of the objections to the system was that some of the districts such as Balaghat were too small and had not sufficient public works or expenditure to justify a staff of that strength to look after them, the witness suggested two alternative solutions, either the institution of a provincial cadre, or the confining of the experiment to districts where the expenditure on works was sufficient to justify it, for example Nagpur or Jubbulpore. If it succeeded in those places, it might be then extended to other districts, with such reductions in staff as might be found necessary; but it should be tested by experiment first.

1,244. He was of opinion that there was a good deal of money wasted on repairs to roads mainly due to insufficient supervision. He did not think that an increase of staff would meet this difficulty, but advocated the employment of contractors for such repairs, although he had no practical experience of such a system, nor did he know whether it had already been tried in India. On being informed that the system had already been tried and had been found so inefficient that it had had to be discontinued, the witness stated that so long as supervision was dependent on mates and supervisors, the work was bound to be inefficient, but if a lump sum contract for a length of ten to twenty miles of road were given to a contractor and supervised by an officer of superior rank who would make periodical inspections, say about four times a year, the difficulty would be overcome. He had no experience of road maintenance in Europe, nor did he know whether such a system had been tried and failed even in more advanced countries. Unless he was informed of the reason why this system had proved a failure in England, he would recommend its adoption in India. He had consulted some retired

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engineers in Nagpur in this connection several of whom had expressed their willingness to take up such work.

1,245. He recommended that certain portions of the work of local bodies, such as wells and school buildings should be made over to local board members, or preferably to the headmen of villages (*malguzars*) for construction, plans and estimates being prepared for them in the first place and handed over to them for execution. Such men would, he admitted, probably have to make a little money out of the transaction, but this might be looked upon as an honorarium. There was a law under which no local board member could take up a contract, but witness thought it could be relaxed; he did not see any harm in allowing members of a municipality or district board to take up a contract for the construction of a school, for example.

1,246. He recommended that the headmen of villages should be made responsible for the upkeep of the arboriculture within village limits. Personally, he had no experience of this system, but he admitted that a similar system had been tried on a very large scale in the Central Provinces under which *malguzars* had been made responsible for the maintenance of the road-side trees in their villages, and that it had had to be abandoned. He believed that the complaint of these *malguzars* was that they had not been adequately paid, or had not been paid at all, for the work that was expected of them. He thought they would be willing to take up such work if they were paid the present, or even smaller, rates.

1,247. He suggested that buildings for local bodies such as schools, pounds and *serais*, which had been constructed by the Public Works Department, were too good for requirements and he believed that the question of simplification of designs with a view to reduction of cost was now under consideration by local bodies. The district council decided what buildings were to be constructed, but they had to be built in accordance with the plans of the divisional fund engineer. In the past, all school buildings had been constructed in the same style as the other houses in the village. He did not mean to infer that the buildings erected by district councils were extravagant, but they were unnecessarily good. It was generally thought that district councils were supposed to erect buildings according to standard plans approved by the Director of Public Instruction, but in reality all that that officer laid down was that a school room should be of a certain size and have a certain amount of light and so on; it had, however, lately been the custom to erect unnecessarily good buildings for village schools. The whole question was raised in council some time ago, and it was then agreed that such buildings should preferably be less costly.

1,248. He advocated a system under which the appointment and dismissal of works establishment should be under the control of the board of works, and considered that it would be quite reasonable on the part of government to make over a large amount of work and money to district bodies, provided they retained a representative on the board. He thought that, if the Public Works Department staff were made over to district councils, it would be quite sufficient if government retained control over their appointments and dismissal. If, however, this staff were handed over entirely to the control of the local bodies, the Commissioner would act as government representative, and the Deputy Commissioner would have the same control which he at present exercised over their other affairs. When he suggested in his written memorandum that local bodies should be given an entirely free hand in regard to their own works, he did not mean more than that.

1,249. He suggested that contracts should be given for the construction and maintenance of original works for a certain number of years. Such a contract would be given to an approved contractor, and would be contingent on continued satisfaction in the execution of works being shown, i.e., government would be bound beforehand to give all its work in a certain district to a particular contractor for a term of years. The rates would be fixed from time to time, according to circumstances, as the contractor would probably be unwilling

to work on fixed rates for a long period. At the present time, contractors complained that they were changed so often that they could not maintain a sufficient staff of *coolies*, etc. In connection with the grant of licenses to contractors, he stated that in the first instance he would look to their monetary condition; in the second place he would see whether they had a sufficiently competent staff, and thirdly he would ascertain whether they had had experience in the execution of public works, and only if a contractor were satisfactory in these respects would a license be granted to him. By the adoption of such a system, it would be possible to know at once whether any particular contractor were financially sound, which would be of great value to the engineer in charge, otherwise if a new engineer came to the district, he would not know whom he could safely select. This system would also lead to competition between contractors, a list of whom would be kept. A youth who wished to start in life as a contractor would derive great benefit by being employed under a licensed contractor, as having worked for such a man, he would probably find no difficulty in subsequently obtaining a license himself.

1,250. He suggested that the surveying of roads should also be carried out by contractors. There were no such surveyors in his district, but he thought that, if suitable prospects were held out, surveyors could be obtained from other parts, e.g., Bombay or Calcutta. He had no personal knowledge of the class of firm which would take up such work, but had been told, in Bombay, that there were people there who would be willing to do so.

1,251. He was of opinion that competition between English and Indian firms should be discouraged as the latter could not, at present, compete with English firms. If the tenders of two firms one of whom was English and the other Indian were equal, preference should be given to the Indian firm, provided its standing was satisfactory.

1,252. (*Mr. Cobb.*) In the event of his scheme being accepted, he would give district boards a great deal more work to execute than at present, but was rather doubtful in regard to municipalities. The reason for this distinction was that municipalities could not afford so costly a staff as district boards, and hence the former had to get their work done by unskilled agency. Costly works, in the Balaghat district, were executed by government, while for the construction of original works the cost of which was very small a low paid *mistri* was employed.

1,253. (*Rai Bahadur Ganga Ram.*) Under his scheme the travelling allowance granted to a first-class engineer would be Rs. 150 a month; to a subordinate it would amount to Rs. 100 a month. The total cost of his scheme worked out to about Rs. 6,96,000 as against Rs. 10,40,000 at present spent by the Public Works Department.

1,254. Whether the district engineers would be placed under the control of the boards of works depended on the powers government was willing to confer upon them. Government would have to be represented on these boards, and he advocated that the Deputy Commissioner, or a person deputed by that officer, should be selected, but not necessarily as the chairman of the board.

1,255. So far as he remembered the retired engineers whom he had consulted were quite willing to undertake repairs and maintenance of lengths of road even at the present rates.

1,256. If powers of dismissal were given to a board of works, they should be given powers of reduction also. It depended upon the nature of the evidence against him whether an engineer who had been badly reported upon would be dismissed at once or not.

1,257. When he had suggested that the surveying of roads should be undertaken by private firms, he had meant engineers in private practice and not contractors.

1,258. (*Mr. Mackenzie.*) He admitted that India was indebted to the Public Works Department for all its railways and roads, in fact for most of the material progress India had made. When he stated in his written evidence that the Public Works Department had been described by some people as the "Public Waste Depart-

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ment," he had made the statement not necessarily as reflecting his own opinion, but merely for the information of the Committee. He admitted that it was almost the only large spending department, and hence was naturally the object of criticism.

1,259. If an Indian firm employed a staff composed entirely of Europeans, he would still call it an Indian firm; the employment of English subordinates would not necessarily make it an English firm. He advocated that Indian firms should employ Indians as far as possible, but that would be a matter for such firms themselves to consider. If they wished to employ European agency he would not debar them.

1,260. (Sir Noel Kershaw.) If the work to be carried out by district agency was partly government and

partly local board work, the board of works would include a member of the local board as well as a government representative, and the engineers who executed both kinds of work would be under the control of the board in regard to both.

1,261. (Rai Bahadur Ganga Ram.) To facilitate the promotion of a particular engineer who had done good work, witness suggested the institution of a time-scale, or even a provincial cadre under the control of the district boards.

1,262. (Mr. Mackenzie.) In his written evidence he had taken out the ratio of the establishment charges to works charges for the years 1914-1915, 1915-1916, and 1916-1917. He admitted that the fact that these were war years probably affected the figures.

W. R. STEVENSON, Esq., Assistant Comptroller, Central Provinces.

(The views expressed in this note are purely personal and are in no way those of the Accounts Department.)

Written Statement.

1,263. Prohibition against making payments during the last days of the month.—I am not sure what prohibition is referred to. In paragraph 2 of Amalgamation Memorandum 8, dated the 5th April 1912, all sub-divisional cash books are to be closed a few days earlier than the end of the month, the actual date being left to the discretion of the Executive Engineer. As a matter of fact, the date generally adopted is the 25th, but in some cases it is the 27th. I have not known Executive Engineers to object to this rule on the grounds set forth. In paragraph 85 (1) of the Central Provinces Public Works Department Manual of Orders, Volume III, it is laid down that no bills should be prepared after the 20th March. This is intended to prevent hurried payments at the close of the year in order to utilize the grant. See also paragraph 79 of the Manual. In my inspections, so far as I can trace, I have objected only to the majority of the payments being made on the last working day of each month, and have urged the desirability of the payments being made throughout the month. The reason for this objection is that under the present practice there is a congestion of charges and scrutiny is imperfect, as the accounts have to be closed in the divisional office in time to admit of the monthly accounts being prepared. I find that in most cases contractors' bills on running account are not even paid once a month, as required by Public Works Code, Volume I, paragraph 777. When I have referred to this delay I have been told that the work has not made sufficient progress.

1,264. Early date prescribed for the submission of the monthly accounts.—I do not understand how an earlier closing can interfere with executive work when the working month is, for the Executive Engineer's office, the calendar month, and for sub-divisions the same working period, except that the cash books are opened on the 26th of one month, and closed on the 25th of the following. The Executive Engineer need not necessarily return to headquarters to examine his books and sign his monthly accounts, as under Public Works Code I, paragraph 1357, the accounts can be signed by the accountant "by order", and the Executive Engineer can check his books when he returns to headquarters.

1,265. Prohibition against making advances to contractors.—The prohibition referred to is that in Public Works Code I, paragraph 779, I am not prepared to say that in practice it is not a wholesome and necessary rule. Contractors should be able to carry on work with monthly payments and not require advances. The Public Works Department often helps contractors in the matter of paying them on the security of "materials at site", even when according to their agreement they need not be paid except for finished work.

1,266. Excessiveness of audit objections.—It is a pity that some concrete examples of objections due to errors in the system of audit were not furnished. It entirely depends upon what an executive officer understands by an audit objection, to judge whether the number

is excessive. Take for instance, objections raised by the audit officer to want of sanction to repair estimates, and absence of detailed estimates for the various irrigation works. The regulations require the audit officer to notice all such absences in the matter of sanctioned estimates, and if the audit officer did not enforce them the audit of work accounts would be defective.

Some objections formerly taken to excesses over estimates are no longer raised, since the powers of Executive Engineers have been extended. I should like to add that sufficient advantage is not taken of paragraph 4 of the note on standard form No. 27. I have, through the medium of audit notes, and personally at inspections, urged the full use of this means of explaining any discrepancies or irregularities, so that the audit office may not make inquiries on them in the audit note. An account officer is bound to be thoroughly satisfied in all respects with the schedules and vouchers sent up for audit, otherwise he must refer to all shortcomings in the audit note; and in the statement of objectionable items which goes through the Executive Engineer to the Superintending Engineer, he notices all other defects in respect of estimates or allotments and certain other items.

1,267. Unsuitability of financial year.—I am quite in agreement with this objection. In my opinion, the official year, if it begins on the 1st October, will suit the needs of the Public Works Department. The report of the Currency Commission has recommended the official year to begin on 1st November.

1,268. Changes in budget system.—This point has been settled by the recent orders of the Government of India giving power to the local Administration to reallocate lapses of budget grants of one year in the following, in respect of the Public Works Department.

1,269. Compilation of divisional accounts in a central audit office.—I do not favour the compilation of the accounts in the Central Audit Office, that is, the Comptroller's, because it would not be as convenient for all concerned as the Superintending Engineer's office of each circle. The Superintending Engineer would control the accountant, or chief accountant, as the case may be. This is likely to prove an economical arrangement as well as possessing other advantages over the compilation in the Comptroller's office.

1,270. Formation of a separate Accounts Branch in each divisional office.—This proposal is not one that I can recommend.

1,271. Personal views on other points.—If the Committee desire to inquire about the question of peripatetic audit, I am prepared to state my views, as I worked this system for about fifteen months, some years ago, in the Bombay Presidency.

(2). It seems to me that it would be possible to abolish altogether the upkeep of a register of works by sub-heads, and simply to keep it by sub-works. If this appears too drastic a change, then I would suggest the limit being raised from Ra. 5,000 to Ra. 25,000. When the sub-heads are separately detailed, there seems to be no need for striking any rates, only quantities of work done (and not rates) would be useful. I say this, because I have never seen any use made of these rates, and they are needless clerical labour.

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MR. J. STUART-MILNE & MR. W. R. STEVENSON.

[Continued.]

MR. J. STUART-MILNE (Comptroller, Central Provinces) and MR. W. R. STEVENSON called and examined.

(The views expressed are purely personal and are in no way those of the Accounts Department.)

1,272. (*President.*) Mr. Milne stated that as Comptroller in the Central Provinces he was the head of the Accounts and Audit Departments there, and that Mr. Stevenson was the Assistant Comptroller and would give evidence on any particular technical points upon which he might be consulted.

1,273. He agreed that the system of accounts followed in the Public Works Department was very complicated, and that the maintenance of the divisional accounts by the Executive Engineer occupied such a substantial portion of that officer's time that it was very detrimental to his executive work, and remarked that he had prepared a scheme which he thought would remedy this difficulty. This scheme was drawn up purely from the accounts point of view and had nothing to do with the executive portion of the Executive Engineer's work. He considered that the compilation of the Executive Engineer's accounts on the monthly forms was unnecessarily complicated and took up too much of the time of the executive staff, but he was opposed to having an independent accountant in each Executive Engineer's office, directly responsible to the Comptroller, and preferred, as an alternative that the Executive Engineer's accounts should be compiled in a central office. He suggested that, with each Superintending Engineer at the headquarters of a circle, there should be a chief accountant, under whom would be an ordinary accountant and a staff for the compilation of the accounts of the circle concerned. One accounts clerk, as distinguished from an accountant, would be retained by each Executive Engineer to help that officer in passing bills, doing simple arithmetical checks and other minor details. As the accounts would go up to the chief accountant in the Superintending Engineer's office for compilation by the accounts staff there, the Executive Engineer would have no accounts correspondence and very little accounts work left and would hence be free to go about his division and attend to his executive duties.

1,274. All compilation accounts work would then be concentrated in the Superintending Engineer's office, where the chief accountant, who would be a whole-time gazetted officer, would be responsible for it. The Executive Engineer would, however, be primarily responsible for the allocation and classification of the accounts. If the accounts came up to the witness as Comptroller in this way, it would be very much easier for him to audit them, and he surmised that his scheme would save the cost of three accountants and ten clerks.

1,275. Under his scheme, each Executive Engineer would be responsible only for the preparation of his original records and for the submission to the circle accounts officer at the Superintending Engineer's headquarters of a copy of his cash book, showing what payments had been made, and of his vouchers, from which materials the central accounts office would compile the accounts. The Executive Engineer would have no correspondence, or dealings with objectionable items statements, and, as payments were usually made by the sub-divisional officers, the Executive Engineers would be relieved of an immense amount of their present accounts work. Another point in favour of his scheme was that the whole of the accounts would be received by the circle chief accountant and would thus be in much earlier and the Superintending Engineer would see the results about a month earlier than at present and be in a better position to understand the state of the finances of each of his divisions. The scheme, if adopted, would also economise in staff and be a very great improvement on the present system.

1,276. In the last appropriation report by the Comptroller-General the percentage of total audit objections to total expenditure for the year 1913-14 was 28 per cent.; the following year it was 27 per cent., and last year it was 21 per cent. These objections were mostly of a technical nature, i.e., in many cases the correct

procedure had not been properly followed, and the majority of the objections were to excesses over estimates, want of estimates, want of appropriation, excess over appropriation, miscellaneous irregularities and so on.

1,277. In connection with audit objections to rates he explained that the procedure followed was as laid down in the Government of India Code, and that an audit officer was bound to take notice of any rate which differed from the usual rate. He instanced a case which occurred some months back in which the Accounts Department had noticed that for the same class of work two different rates had been given; they had naturally questioned this. Mr. Stevenson here explained that it was natural that such a case should be challenged and added that the Accounts Department would not be doing its duty if it passed two different rates for the same kind of work in the same place and in the same account. The two payments were for the same description of work in the same district, but were not for the same work. Mr. Milne then remarked that as a general rule the Accounts Department took no notice of rates, and left them to the local Administration and engineers concerned.

1,278. There would be no objection, from an accounts point of view, to the suggestion that, if it were considered undesirable to let contractors know the rates entered in the estimate, Executive Engineers in calling for tenders might show them only the total quantities and no rates at all. Mr. Stevenson remarked that it was only in connection with repair estimates that it was usual to have a schedule of rates and to quote these rates to contractors asking the latter to bid at a percentage rate below them and that in the case of original works contractors were not shown the rates at all, the rates quoted being compared with the estimated rates before a contractor was selected. In the Central Provinces, when the quantities were communicated to contractors, they invariably replied that they would do the work at the Public Works Department estimated rates. This was not, he thought, the practice in any other province in India; he himself had served in the United Provinces and Bombay, where tenders were invited in the ordinary way, the description of the work and the quantities being posted and contractors being asked to quote rates for them. No money figure denoting the total was mentioned to the contractors.

1,279. The criticism against the accounts rule which prohibited an Executive Engineer from making payments during the last days of the month was not applicable to the Central Provinces, where no such rule was in force. Mr. Stevenson explained that the month for sub-divisional officers was calculated from the 25th of one month to the 25th of the following month, in order to enable these officers to send in their accounts five or six days earlier, but that this did not prevent them from making payments to contractors; for example, if a sub-divisional officer closed his books on the 25th of a certain month, a payment made on the 26th would be entered in the accounts of the following month.

1,280. Mr. Milne did not agree with the contention raised by certain Executive Engineers that the 10th of the month was an unsuitable date for the submission of accounts on the ground that it was detrimental to the executive duties of those officers, since the work of compilation occupied not only their whole attention, but also that of their staff, and stated that there was no necessity under Code rules for the officer himself to be present; the accountant could send in the accounts. The 10th of the month had been fixed as the date for submission in connection with the speeding-up of the accounts, after the amalgamation of the civil and public works accounts, since it was essential to get all the government accounts ready at the same time, and the Public Works Department had hence to fall into line. There was objection, therefore, from an accounts point of view, to fixing a later date than the 10th.

1,281. He expressed himself as absolutely in agreement with the contention that the present ending of the financial year, viz., the 31st March was unsuitable as it

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occurred in the middle of the Public Works Department working season. The 1st of April was an inconvenient date to start a new financial year not only for the Public Works Department, but also for other departments. He here read out an extract from the Report of the Indian Finance Commission on this subject as follows:—"It is clear in fact that from the financial point of view the present date is almost the most inconvenient possible for the budget, and the suggestion has therefore been made that the date of the beginning of the financial year should be altered from the 1st April to the 1st November or 1st January. There may be administrative difficulties in carrying this suggestion into effect, but financially it would be a great improvement." The witness remarked that the 1st November would be an excellent date for the Public Works Department, as there would be seven months of the working season available for carrying out works. It would also prevent the rush of expenditure in March, and other objections, which now cropped up every year. This change, however, could not be made for the Public Works Department alone; it would have to be a general change affecting all departments.

1,282. In connection with the question of lapses of unspent balances, he quoted the following extract from the Government of India letter No. 705 A. G., dated the 16th October, 1916, on the subject:—"They (the Government of India) are of opinion that the best method of preventing hasty and wasteful expenditure towards the close of the year is to get Public Works officers to realise that there will ordinarily be no difficulty in getting lapses re-granted for the year following, and that this is preferable to rushing through expenditure in March without proper safeguards for its application. The sooner officers can foresee and report lapses, the easier the process of re-granting will be. I am therefore to request that when the first edition of the revised and budget estimates is submitted, an accurate forecast (showing details by works) of lapses which will occur in the current year and which it is proposed to spend in the coming year may be made out and the necessary reductions and additions suggested in the revised and budget estimates respectively. Similarly, when the second edition of the budgets is submitted alterations due to further anticipated lapses on works in progress should be suggested for adoption, but it is undesirable to introduce alterations in the third edition unless they are of a really important and urgent character", and remarked that ordinarily Executive Engineers and other officers were supposed to submit their accounts as soon as possible after the end of a year and amounts which lapsed were re-allotted practically as a matter of course. The Government of India had suggested the above procedure to meet the conditions of the present financial year. He thought it was the only solution under existing circumstances and that from the accounts point of view there would be greater objection to any other system being introduced in regard to lapses.

1,283. Though the system was not in force in the Central Provinces, he saw no objection to the proposal that the Executive Engineer might be given a contract grant in respect to repairs for a period of years in the same way that a revenue officer was at present given a contingent contract grant, for example, if an Executive Engineer spent half a lakh of rupees on repairs to buildings on an average every year over a period of years, such an officer might be given in future a contract grant for a period of five years and the savings of one year be set against excess expenditure in another or *vice versa*.

1,284. He expressed himself as being personally in agreement with the Code rules which prohibited advances to contractors, as he considered that contractors ought to possess sufficient capital to make such a course unnecessary. A contractor who lived a hand-to-mouth existence ought not to be encouraged. From an accounts point of view outstanding advance accounts meant a tremendous lot of extra work, being entered in objection statements and thus swelling their size. He had never heard of any inquiry into this subject having been undertaken in the Central Provinces.

1,285. (*Sir Noel Kershaw*.) About twenty-two different kinds of schedules were submitted monthly to the Comptroller by the Executive Engineer. The Superintending Engineer and not the Executive Engineer would, under the scheme he suggested, submit these schedules. Only cash-books, vouchers and notes showing how the payments were to be allocated, *i.e.*, the same records that the sub-divisional officer now submitted to the Executive Engineer, would be sent by Executive Engineers to the Superintending Engineer. He was of opinion that his scheme if introduced would relieve an Executive Engineer of about 80 to 90 per cent. of his ordinary office work. He remarked that he would like to combine with his scheme a system of peripatetic audit, which he considered would further reduce work. Local funds in the Central Provinces had at present a system of peripatetic audit. He added that Mr. Stevenson had had experience of such a system in Bombay, which Mr. Stevenson admitted and added that the system was abolished because the Government of India were not really in favour of it. The idea was that of a Bombay officer, Major LeBretton and, though it was not very favourably accepted at headquarters it nevertheless appeared to him to be the best system of audit, and the Executive Engineers in Bombay were very sorry when reversion to the old system was decided upon. During the working of this scheme the Bombay Presidency was divided into four circles and four auditors were appointed with staffs to do the peripatetic audit, but as these officers were not given gazetted rank, it was considered necessary for a Deputy Examiner of Accounts to inspect their work every six months and an Examiner of Accounts to inspect the same every year. All this swelled the cost. Personally, he considered that there was no necessity for these inspections, as those who had seen the auditors' work admitted that there was nothing to inspect. No audit objections were issued during this time, attention being drawn to expenditure not covered by Code rules in a register kept in the Executive Engineer's office. The auditor kept a note of what he had written in this register and generally found, when he returned, that a reply had been made to his remark. Mr. Milne added that he thought the combined scheme would mean a great saving to government.

1,286. The chief accountant proposed for the Superintending Engineer's office would receive gazetted rank and a salary of Rs. 450—600 and be in a position to argue and talk over matters with the Superintending Engineer. The peripatetic auditor might be an Assistant Comptroller or Deputy Comptroller, who would tour with a staff of auditors. The chief accountant would be the Superintending Engineer's financial adviser.

1,287. This scheme would remove, he thought, the present difficulties experienced by Executive Engineers owing to the 10th of the month being fixed as the date for the submission of their accounts. Superintending Engineers would not have much extra work, as the chief accountant would be competent to sign and submit all accounts to the Comptroller, while the staff collected in the Superintending Engineer's office from the divisions would be quite adequate for the work required.

1,288. (*Mr. Mackenzie*.) Superintending Engineers would be acquainted with the details of the Executive Engineer's work and could, while on tour, receive personal explanations from these officers in regard to objectionable items, looking into matters themselves where necessary. The system would not materially increase the Superintending Engineer's work, if a gazetted accounts officer were appointed as he proposed. Besides this the Superintending Engineer would also be in a position to see exactly how his divisions were getting on as the accounts of each division would come to him every month. The difference between a gazetted and a non-gazetted officer was merely a difference in status.

1,289. (*Rai Bahadur Ganga Ram*.) Mr. Stevenson stated that the limit fixed for work for which accounts were kept by sub-heads was Rs. 5,000. His experience had proved that the registers of works were practically useless in their present condition; he therefore suggested that this limit might be raised to Rs. 25,000 if it were

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intended to keep sub-heads at all, otherwise accounts might be kept by sub-works. For small repairs there were no sub-heads, but for large repairs costing more than Rs. 5,000 sub-heads were kept.

1,290. Mr. Stevenson explained that the peripatetic audit was carried out in the Bombay Presidency once a month, and that he began his audit with the Sind province. It took two or three days to audit the accounts of one division, but this period varied according to the size of the division. He had a staff of four men under him. He preferred a monthly to a quarterly clearance of all questions of expenditure, and although he admitted that a quarterly audit would save in travelling allowance, he did not approve of it as during that period the accounts would have to be booked unaudited; if however the Government of India altered the system, he saw no objection to a quarterly audit from an accounts point of view. The Comptroller made an annual inspection of Executive Engineers' offices and a certain number of sub-divisional offices and undertook a test audit of one month's accounts.

1,291. His remark that advances to contractors were objectionable was made from the point of view that it would give extra work to the Accounts Department in keeping the accounts of such advances. It was, however, left to government to make advances permissible by abolishing the Code rule.

1,292. Mr. Stevenson admitted that when contractors were called for and no original rates shown them, it was not possible absolutely to prevent leakage of information as to the estimated rates, but added that in most offices the men were reasonably honest.

1,293. From every point of view the 1st of November was a better date for the commencement of a new financial year. Budgets could then be produced three or four months earlier. The idea in fixing this date was to see the result of the monsoon as until the monsoon was well established the estimates for the following year could not be framed. The change of the date for the submission of accounts from the 20th to the 10th was made by government after the amalgamation of the public works

and civil accounts. The amalgamation had been in force in the Central Provinces since 1912.

1,294. The sub-divisional officer was also a disbursing officer. If the chief accountant he proposed were allowed to sign the accounts, it would not be necessary for the Superintending Engineer to be at headquarters on certain days every month. So far as the accounts were concerned under his scheme, the Executive Engineer would be in the same position as the present sub-divisional officers were, and would keep only his cashbook. Every item would be posted from the vouchers in the Superintending Engineer's office by the staff there, division by division, and the results would be presented to the Superintending Engineer in the register of works immediately thereafter. One advantage of this system would be that the Superintending Engineer would know at once where an Executive Engineer's work was faulty.

1,295. In respect to his previous remark that contractors in the Central Provinces invariably tendered at Public Works Department estimated rates Mr. Stevenson explained that this had always been the case and not merely since the war broke out.

1,296. (Mr. Durie.) When informed that Mr. Durie had recently accepted a tender in Jubbulpore from a contractor at 2½ per cent. below estimated Public Works Department rates; he rejoined that Jubbulpore was one of the best stations from a contractor's point of view, and that contractors in the province generally did not tender below estimated rates. He very seldom found anything but the rates entered in the Public Works Department estimates in his records.

1,297. Mr. Milne reported that there was a good deal of room for a simplification in the forms of accounts, heads of classification and the restrictions on Executive Engineers' powers to write off tools and plant. There should be a special committee appointed to discuss this question. On the civil side detailed heads of classified abstracts were being cut down, and he thought it would be possible to do the same in the case of the public works accounts.

At Nagpur, Friday, 26th January 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (President).

SIR NOEL KERSHAW, K.C.B.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

C. S. COBR, Esq., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :-

G. A. DURIE, Esq., A.M.I.C.E., Superintending Engineer, Central Provinces.

D. G. HARRIS, Esq. (Secretary).

R. MITRA, Esq., A.M.I.C.E., Superintending Engineer (retired), Central Provinces.

Written Statement.

1,298. (General.) The Public Works Department has been the drudge of all services. To borrow the words of a great English statesman, it has "rendered more services and received less gratitude than any institution in the land." Imperfections lie on the surface; one hears often of failures and rarely of achievements. To ask, so late in the day, whether the Public Works Department meets the needs of other departments, is to ask whether India has been lying still or moving all these years. And yet for wellnigh a century that Department has been striving to make India what it is to-day, and has guided from inception to fruition works of magnitude and importance such as were never before chronicled in India, or even out of it. It has supplied roads and railways, the vital organs of industry and commerce; it has raised temples

for the worship of faith and learning, science and art, law and order, justice and discipline; it has converted deserts into lands flowing with milk and honey; it has, indeed, provided the very main springs of material progress in every department and direction. One by one its component members have been separated and set up as independent departments. Two Royal Commissions have been sent forth to feel its pulse and examine its residual constitution and vitality. The palliatives suggested by one had hardly had time to take effect, when the other came to prescribe more soothing remedies. Before the arrival of that prescription, a third Committee has followed armed with new instruments of analysis and research. And the public is lost in wonder whether the Committee has assembled to bring new life and vigour, or to bear the pall and write an epitaph.

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(2). The gracious message to the people from our beloved sovereign before he left our shores sent a thrill of new hope through all loyal India, which is still pulsating through her veins. And the Public Services Commission which followed soon after with the royal command to examine and report on the limitations that exist in the employment of Indians, gave rise to hopeful anticipations in all departments of the public service. And now, for the sole benefit of the Public Works Department, a Committee has been organized with a view to secure, more particularly, the substitution of private for departmental agency, not non-European for European. In this province there is at present little or no scope for putting this suggestion into practice and in all India what private agency of any significance is visible which is not wholly European? It is our firm and deep-rooted conviction that beneficent measures are coming for the good of the Indian and the non-Indian alike. Those measures have, however, not yet seen the light of day, and in the gloom of uncertainty the mind of the Indian public is filled with apprehension, if not with alarm. The machinery of every department needs a periodical renewal and re-adjustment. The Public Works Department organization is of a highly technical and complex nature and no suggestions of value towards its improvement or reform can be made except after the most careful study and anxious consideration. The time given in hours to the public, both official and non-official, might with advantage have been given in days. The activities of the Industrial Commission have been absorbing public attention in great measure, and the approaching close of the official year has no doubt made the position of official witnesses one of extreme difficulty and inconvenience. More than one summer must pass before the recommendations of the Committee may be expected to bear fruit. A less rapid itinerary than that sketched out might perhaps have proved of greater value in discussing the problems placed before the public. And in a hurried memorandum like this a very imperfect survey of the fields opened up for discussion is all that can be submitted for the Committee's consideration.

1,299. (I.) Economy and suitability of methods of the execution of works.—*Buildings and Roads*.—In order to satisfy the two tests laid down by the Government of India, *viz.*, economy and efficiency, it is of the utmost importance that a comprehensive and well-considered programme of construction should be maintained in each province. Persistent effort has been made in the past ten years or so to place the construction programme of this province on a satisfactory basis. In spite of the rapid march of events in recent years and the disturbing influences of "scarcity" conditions, actual or apprehended, a great deal has been achieved in this direction. Much, however, still remains to be done. The ideal to be aimed at in the preparation of projects is to ensure their being sanctioned, or at any rate their being submitted in a well-advanced stage, before the beginning of the official year in which they are intended to be carried out. The final issue of the budget would thus provide for only finally sanctioned works, or for administratively sanctioned works detailed plans and estimates for which are about to receive final sanction. The annual programme of construction outlined in the Pachmarhi Conference Notes has been a great step forward in this direction, but it does not go far enough. By the time these notes reach the Executive Engineer, the monsoon fairly establishes itself, and the rainy season which is the best time for preparing estimates cannot be fully utilized for that purpose. Sites cannot be selected during the rains outside the headquarters of districts and by the time the question of accommodation is definitely settled with the heads of departments the Executive Engineers and sub-divisional officers find themselves in the midst of the busiest part of the working season, and estimates for the ensuing year cannot then be pushed on except under great difficulties. At the Pachmarhi Conference, Commissioners and Heads of Departments should not only settle what new works must be carried out in the coming year, but also indicate what new works will have to be taken up the year after. That is to say, while at this conference the budget for the

next year would be practically determined finally, the programme of the year following would also at the same time be provisionally laid down. For the purposes of these provisional lists, Commissioners and Heads of Departments should obtain from the Superintending Engineer or Executive Engineer rough cost in lump-sums, without calling for any estimates even in Stage I. In this way, the scheme of construction would be kept well ahead, and the chain of operations, both in the office and in the field, would remain unbroken from year to year.

(2). Suppose in June 1916, while coming to a final decision on the works to be carried out in the year 1917-18, it were also determined what works would be required in the year 1918-19, then so far as the programme of 1918-19 was concerned—

- (i) it would be possible to select sites and settle other preliminaries before June 1917, *i.e.*, before the next conference;
- (ii) the conference of June 1917 should then be able to say definitely which of these works should be finally placed in the budget for 1918-19;
- (iii) the Public Works Department could then proceed at once with the detailed preparation of estimates, with the help of the information already gathered, and get them all well advanced if not actually sanctioned by the 31st March 1918; and
- (iv) the actual construction could be put in hand on the 1st April 1918, the collection of materials being pushed on in the preceding months as far as practicable.

To what is known as the first stage of the estimates, far greater significance must be attached than has hitherto been attempted. Save under exceptional circumstances no Stage I estimate must be called for, unless it has been accorded a definite place on the programme of construction, as indicated above. That is to say, taking the example of 1918-19 assumed in the foregoing paragraph, Stage I should come in when the conference of June 1917 has decided what works are to be definitely taken up in 1918-19. Between June 1916 and June 1917, only preliminary action would be taken on the provisional lists of works for 1918-19 passed at the conference of June 1916; or in other words, the Commissioner or head of the department would place himself in communication with the local officers, make up his mind as to the urgency of the project and the accommodation to be provided, and get the site selected and inquiries made for its acquisition; and the Executive Engineer would collect data regarding foundations, materials, etc., and keep himself ready for the actual preparation of plans and estimates. With the preliminaries advanced so far the Stage I proposals should be far more explicit and accurate than they are at present. The Executive Engineer should be able to state definitely what the foundations are to be, what materials can be obtained locally, what the cartage of materials will cost, etc., and in the case of bridges would be in a position to discuss the waterway to be provided and the general design to be adopted. In this way, the estimated cost given in Stage I would not be likely to differ largely from the final estimates; and the Stage II could be got through with comparative ease. In all ordinary cases it would merely involve the reproduction of plans and sections already "typed" or "standardized," or of those for similar works actually carried out before. The passage of Stage II estimates from the sub-divisional officer to the highest sanctioning authority would be greatly accelerated, and the labour involved in their preparation immensely reduced. And, ordinarily, this Stage II ought to be treated as the final, *i.e.*, the third stage, the sanctioning authority merely directing that certain instructions might be attended to in actual execution, or that certain corrections might be made in the plans and estimates before carrying out the work.

(3). *Road schemes* - Although great care is periodically taken in drawing up the road scheme of a district, its scope and limits have often been peremptorily determined by the exigencies of famine. The sudden and rapid

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changes thus undergone have impaired its stability, if not its ultimate utility in considerable measure. The "scarcity" policy of Sir Reginald Craddock, which succeeded in linking together the mitigation of distress and the expansion of the ordinary programme of construction has greatly simplified the problem. Nevertheless, the supreme necessity of a famine does not invariably coincide with the normal needs of a district, and concentration of effort on definite lengths and objects, for an undisturbed period of activity, has not always been easily practicable. The preservation of old arterial roads, and the provision of really first-class roads passable throughout the year have, therefore, not advanced commensurately with the vast outlay on communications. The accomplishment of these objects is being continuously put back by the demands for opening out new tracts, and a halt must be made for some definite period in the multiplication of new roads, except of the lowest class, until the improvement of important old lines of communication has been substantially achieved. The theory that the provision of railways within an area puts an end to the importance of the old parallel roads which formerly served that area, may be regarded as having been more or less completely disproved. The most striking illustration of the loss sustained by this Administration by too rigid an adherence to this theory is afforded by the history of the Khandwa-Mortakka road. This fine old first-class military road was believed to have been entirely superseded by the new Rajputana-Malwa railway, and it was accordingly reduced at once to Class III. Before long it degenerated into a hopeless cart track and its subsequent development is well-known. It was first raised to Class II-B, then to Class II-A, and ultimately to Class I; and after its recognition as a first-class communication, ten years' close and steady attention had to be devoted towards the improvement of the road surface before it could be brought to a state of efficiency at all adequate to the intensity of traffic borne by it. The condition of the valuable old arteries, such as the Bombay, Mirzapur, Jhansi and Sambalpur roads cannot but be regarded as a disgrace to this province. The so-called Class I provincial roads, moreover, do not by any means approach the standard of efficiency of a really first-class communication. And even as they stand they represent a comparatively small proportion of the communications of the province. Before the famines of 1896-97, the total length of roads was 3,000 miles of which only 27 per cent. was Class I. Each of the two famines of 1896-97 and 1899-1900 contributed an additional thousand miles, without any corresponding increase in the percentage of first-class roads. The subsequent scarcities have brought up the total to somewhere in the neighbourhood of 6,000 miles, but the percentage has not attained a much higher level. The need for reconstructing the road programme on more profitable lines is, therefore, keenly felt and some means must be devised for maintaining a continuity of policy, in order to ensure its early fulfilment and to secure both economy and efficiency in future road construction.

(4). *Arboriculture.*—The provision of shade for travellers along a road is an object the attainment of which ought to receive attention simultaneously with the construction of that road. There seems to be no reason why miles upon miles of arterial lines of communication should be allowed to remain bare and unattractive, while effort is made in other directions. It is most unfortunate that no differentiation is observed between new plantation and subsequent maintenance. This is, indeed, surprising for in all other departmental matters "original works" and "repairs" are rigidly kept apart from each other. The whole expenditure on original plantation and subsequent upkeep is treated as "original works" although the Public Works Department Code distinctly places new plantation as one of the main heads of original works, communications, and its subsequent tending as a main head of repairs. The result has been that in spite of the expenditure of labour and money in the past twenty-five years, practically not a single road has emerged from the "original" head of arboriculture and passed on to "repairs;" and although some effort is made towards differentiation in the periodical returns, it is never in

reality known at what stage the avenue planting ends and its maintenance begins. And while the extension of roads throughout the provinces is growing apace, our road-side arboriculture is unhappily falling steadily and hopelessly behind. A first-class road costs not less than Rs.5,000 to Rs.10,000 per mile, and even an "Improved Class III Road" with proper causeways at *nullah* crossings costs Rs. 1,500 to Rs. 3,000 per mile, according to the nature of the country. There are no reliable data regarding the cost of avenue planting, but the average cost varies from about Rs. 300 to Rs. 500 per mile. The total cost of original construction, therefore, would not be considerably exceeded, were it made the rule that arboriculture must be treated as an essential and obligatory head of "original works communications." The excess of expenditure thus involved would be almost negligible, whereas the convenience of supervision would be very great. A special staff is always told off for construction, which could very well look after arboriculture as well. A new road takes usually two to three years to construct, and with careful attention tree planting could be carried out with ease in three years, so that a definite stage would be reached when the road as well as its avenue would pass from the "original" to the "repairs" side of the accounts, and the tending of plants would become an integral part of the subsequent maintenance of the road. The progress of arboriculture could in this way be placed on more business-like and economical lines, and road construction and arboriculture would proceed side by side, the maintenance of avenues becoming a recurrent obligatory charge in the same way as the general maintenance of the road, at a fixed mileage rate.

(5). As indicated above, the programme of construction should aim at concentration rather than at diffusion, in order that the results might be duly accelerated and the ends of economy fitly served. Improvement is at the same time necessary in the method of provision of funds and regulation of expenditure on works. With the ceaseless demand for new works in every department, the tendency has been to provide for a large number of works at the same time in one year, and either to spread the expenditure on a given number of works over several years, or to spread the operations over too vast an area. Actual experience has been distinctly opposed to this procedure. The Arang-Khariar road, for instance, had been lingering on for fifteen years when I submitted proposals for closing the work, and even those proposals after nearly three years' operations hardly brought the whole length to a tolerable state of efficiency. The execution of a work, large or small, should as far as possible be confined to one working season, or one continuous series of two or three working seasons, and the centres of activity should neither be too many, nor too scattered. The commercial motto of "quick payment—quick return" might, with propriety, be attached to the coat-of-arms of the Department of Public Works. Rapidity of work within reasonable limits of area and outlay is the most essential element of economical construction; it concentrates effort, minimizes chances of dispute, reduces expenditure on supervising agency and interest on outlay, secures stability of labour supply, ensures clear ultimate profit to the contractor and induces offer of better terms of contract. A couple of years ago the Government of India drew special attention to the subject of heavy expenditure in March, which is undoubtedly wasteful in some measure. Although in that letter of the Government of India the subject was in other respects dealt with in an exhaustive manner, the two root-causes of the evil for which a remedy was being sought were left quite untouched. Indeed, a satisfactory solution of the difficulty will never be found until the date for closing the financial year is altered, or the system of lapses is abolished. It is a well-known fact that the financial year (April to March) of the Government of India does not synchronize with the working season of the Public Works Department (October to June). Nor is it a secret that the system of lapse tempts local Governments to draw as largely as possible on the assignments of the official year. With say a 60-lakh budget, the amount of lapse involved would sometimes approximate to 3 or 4 lakhs

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of rupees. With the rapidly growing needs of the province pressing upon the Administration in every direction, it could hardly be expected that so large a sum would be relinquished annually, with alacrity, unless some means were forthcoming to effect its recovery after the official year had gone by. In the attempts made towards finding a cure for the disease, the dominant idea has always been to allay the outward symptoms, and to let the canker inside remain. It must, however, be recognized that the Government of India have larger interests in view than the mere convenience or economy of public works, and that a final pause must be made at the close of the official year, whatever the consequences of such a step to their subordinate administrations and departments might be. That being so, the primary causes must of course be left unremedied and endeavour has to be made to minimize their effects as far as may be practicable. The main points to which attention might be specially devoted are:—

- (i) drawing up of the programme of construction and forecasting of requirements sufficiently in advance;
- (ii) prompt issue of the budget figures;
- (iii) allotting as large a sum for each work as possible at the commencement of the year;
- (iv) making final allotments of funds, which become available, late in the year, towards works in progress which are sufficiently advanced, with as little delay as possible;
- (v) making some arrangement with the Finance Department to secure the transfer, wholly or in part, of the estimated amount of lapse of an official year to the budget statements of the next year.

(6). The advancing prosperity of the province, the extension of railways and roads, the development of resources of every district and the advent of civilizing influences generally of the modern day, which are visibly at work in every town and district, have been accompanied by an ever-increasing growth in the demand for labour and building materials. While the Public Works Department rates have been undergoing changes so swiftly as to render the task of revision of schedule rates one of exceptional difficulty, those paid by the general public have gradually drifted into hopeless uncertainty. Owing to the depletion of labour, caused by the frequent visitations of plague and famine, and the absorption of nearly all available labour on government works and railways and other enterprises, private firms and individuals have been compelled to employ the assistance of Public Works Department contractors and *mistris*, with the result that the margin of difference between Public Works Department rates and ordinary bazaar rates has been steadily narrowed down and is fast disappearing. In Nimar, for example, which is the main centre of commercial activity in the Nerbudda Division, the Public Works Department rates, local fund rates, and rates prevailing in mills and ginning factories are all identical. In Jubbulpore, where both public and private construction is rapidly advancing, the fusion of public and private rates is becoming a marked feature of the division. The representatives of Raja Gokuldas's family, who are the principal private builders of Jubbulpore, are employing Public Works Department contractors and submitting to Public Works Department rates. In Mandla, which has been the most backward district of the Jubbulpore Division, and where labour and materials are scarce, the private builder is, in reality, paying more highly than the Public Works Department. Some difference there will always be between the Public Works Department and private rates, owing to the difference in the standards of work and the middleman's profits and supervision charges. While, however, the Department pays more with open eyes to cover the losses sustained by contractors, arising from non-recovery of advances for labour and materials and in other ways, private builders are led blindly by unscrupulous contractors and *mistris* to begin on hopelessly inadequate estimates, and they are almost

invariably called upon, in the end, to pay greatly in excess of what they had originally bargained for.

(7). This rise in prices and wages which is a necessary concomitant of the general upward march of prosperity all round must, therefore, be regarded as an evil which has come to stay. We have on several occasions successfully resisted the attempts made by contractors to force up the rates, the most notable instances being the construction by departmental agency of the Gour bridge, for which rates 10 to 15 per cent. higher than the schedule rates were demanded, and the construction of the Dhamtari-Sihawa road. The savings effected in this way, on the estimates, for these and other similar works have been considerable. Object lessons to contractors such as these have greatly contributed to economical working, and more substantial results might be obtained by greater decentralization of authority and improved methods of working. An adequate storage of materials of every-day demand, e. g., bricks, tiles, flooring slabs, doors and windows of standard sizes, etc., is very necessary. The officers have often to rush about from market to market for materials at short notice, and if the markets fail or abnormal rains destroy the brick and tile kilns, as frequently happens, they dare not pause and they do the best they can under the circumstances. With a programme of construction for two or three years in advance, it should moreover be possible to regulate the supply of labour and materials, and to limit the cost of works undertaken, specially of those in the more outlying and remote corners of a district, by introducing a system of licensed contract for specific periods and spheres of action, and at specified rates fixed for the periods and areas covered by such contracts. There is a limit, however, to what can be achieved in this direction. Indeed, in dealing with prices and wages, we are confronted with world-factors over which neither departmental nor private agency can exercise any effective control. In this province both minor and major buildings have been uniformly constructed on the most economical lines. Generally speaking, table-moulded bricks have been replaced by cheap hand-made bazaar bricks (so called "*kumhar*" bricks); walls have been reduced in thickness and height as much as possible; unwrought poles have taken the place of sawn rafters; sun-shades are provided only on the exposed sides; and plaster is substituted by lime-rubbing over non-essential walls. In the minor buildings (e.g., jail and police quarters, out-houses of bungalows) the descent goes still lower; the foundations consist largely of metal and *moorum*; the walls are of brick-in-mud, except round the door openings and the tops of walls; the floors are of *moorum* leaped over with cow-dung; the doors are of the cheapest description, and the windows are often absent, their place being taken by loop-holes or honey-combed brick openings. In the olden days the roof of minor buildings often consisted of country tiles laid on bamboo battens, as in the case of the cheap bazaar structures. But these roofs required frequent renewals, and the general rule now is to have a single Allahabad tiled roof or a wheel tiled roof laid on sawn battens. This is a measure dictated by considerations not of mere convenience, but of absolute economy. It is, indeed, by a rigid adherence to economy in these ways that this Administration has achieved a large measure of success in combating the growth of expenditure on public works necessitated by the rise in prices and wages.

1,300. (II.) Encouragement of other agency.—Assuming that an adequate and efficient district council staff is employed in each district, the readjustment of burden between the district councils and the Public Works Department, as regards road construction and repair, should be based not merely on the class of roads, but also on their general importance and the convenience of supervision. The construction and maintenance of arterial roads traversing more than one district must be a provincial concern; all other roads of purely local importance, including short railway feeders, might with advantage be handed over to the district councils, to whom their existence and upkeep are of more immediate interest and importance. By this means, it would be possible to bring some relief to the over-worked Public

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Works Department and to give a fair start to the local fund divisional engineers' scheme. Outlying districts like Mandla, Betul and Chindwara must lie, for the present, beyond the province of the local fund divisional engineer. The extension of railways, coal-fields and mining industries in such districts demands a corresponding advance in the way of communications towards the accomplishment of which the Public Works Department cannot look for relief for many years to come. The Public Works Department must similarly retain the responsibility of all buildings at headquarters of districts, and all buildings along the lines of communication in charge of the Department. All other buildings might be conveniently handed over to local fund agency, with the exception of any outlying police buildings, the maintenance of which the Police Department might wish to keep in their hands. When in 1910 I had to draw up a scheme on these lines for the second circle of superintendence, it was found that the saving in establishment effected thereby was not so appreciable as might have appeared possible at first sight. An elaborate statement was drawn up exhibiting the actual expenditure in the Circle during the preceding five years and what the probable expenditure would have been, had the proposed changes been in force during the same period. The reduction of expenditure on the whole worked out to only 9 per cent.; to go much further than this would, it was feared, tend to impair seriously the organization of the Department. It seems clear, moreover, that any re-apportionment of labour between the Public Works Department and local funds must not over-tax the resources and capabilities of the latter. The district councils of these provinces are far from being in a highly-prosperous condition, and they depend largely for their existence and utility upon government bounty. Any great expansion of their agency in the near future is not likely to produce satisfactory results without increased grants from the local Administration, or transfer of funds from the Public Works Department to the local fund budget. It may lead to decentralization, but it would not conduce to economy in the sense contemplated by the Government of India. It would, on the other hand, seriously affect the general efficiency of the Department, and weaken its staff in so great a measure as to leave the Department unprepared for the exigencies of a famine which might overtake the province at any moment.

(2), In his evidence before the Royal Indian Engineering College Committee of 1903, Colonel J. W. Ottley, C.I.E., R.E., President of that college, stated as follows with reference to the comparative conditions of work in England and India :—

"In India you are the contractor as well as the engineer, and you have to do everything for yourself. From the day you begin to lay out your levels you have got to do everything; you have got to find your earth and make your bricks; you have got to find your limestone and make your lime; and in many cases you have got to teach your men how to do the work. You have got to make your own charcoal, and to do every single thing for yourself. Here you buy your materials in one place or another, or hand the whole job over to somebody else whose business it is to carry it out for you."

Except in presidency towns like Calcutta and Bombay, where European firms of repute are ready to undertake large works, the state of private agency in India is no better today than that described above. The aid of engineering firms of Bombay and Calcutta is invoked, and is available only for the construction of important sanitary works, and for the supply of iron-work and other materials which cannot be obtained locally. It would be impossible to employ these firms more extensively, without offering attractive rates of work such as would be greatly in excess of the current schedule rates. Such a step would be fatal to economy, without in any great measure improving the present degree of efficiency. Great tracts of the province are yet wild, and practically closed to the

influences of outside civilization; welcome would be warmly accorded to any private syndicate, were it forthcoming, to help the Department in the improvement of these tracts. Indeed, agency such as that contemplated by the Government of India is not waiting to be encouraged or developed; it has to be created. With some few honourable exceptions, the Public Works Department contractor is generally of a petty class without skill or knowledge, and lays the whole burden of supervision and accounts on the shoulders of the Department. He comes and goes, drifts from one place to another, always at the mercy of the *bunniah* who provides him with funds and wrests from his unwilling hands the cheques passed in payment of work done. The *bunniah* himself is often cheated by unscrupulous contractors, who have a knack of disappearing suddenly after a heavy payment, with disastrous results both to the money-lender and to the work itself, which is left in a state of complete disorganization. As I had occasion to submit to the Industrial Commission, the only visible agency consists of "a host of speculators and adventurers, a mere fraction of whom are really sound or capable of taking an active part in engineering a business with advantage to themselves and to the public at large. The majority are profit-seeking, but not risk-taking, and cultivate the art of acquiring something when they possess nothing. If a census were taken of the small industries, such as soda and ice factories, brick and tile manufactures, oil and *sarkhi* mills, printing and cotton presses, which have appeared and vanished in India in the last twenty years, it would reveal an appalling record of fraud, failure and ruin. It would illustrate why, in the industrial world, capital remains shy, effort lies crushed, and talent wanders unemployed."

(3). Of capital there is plenty, and of talent there is no lack, thanks to the training-colleges which government has so thoughtfully provided. The great problem is to effect a co-ordination of these two resources, the solution of which can only be obtained by the co-operation of government and the people. The people must cultivate mutual confidence and esteem, and learn the value of thrift and self-reliance; and government must help and guide the people in working together on the basis of co-operation. One sometimes hears of the co-operative principle as if it were a sort of special dispensation of Heaven for the up-lift of agriculture and cottage industry alone. It is however, of a far wider application, and its influence is at work in numerous fields of European activity. We have just heard of a great department of research which is being built on the same basis. The establishment of co-operative societies, in every district, for the creation and encouragement of private contracting agency, would fulfil the requirements of the Department in an adequate measure, and at the same time afford ample scope for the employment of engineers trained at the colleges who fail to secure government appointments. It would, moreover, be helpful towards bringing down the rates for construction and securing a considerable measure of efficiency and economy generally in the operations of the Department. Above all, it would bring the people of the district in close touch with their public works, and enrich them by providing a standing source of employment for the working classes as well as of investment for their locked-up capital. The expansion of the co-operative movement is an urgent need of the country and will require the most anxious consideration of government for its fulfilment. Without active government support nothing is practicable; with that helping hand, private effort is sure to raise and develop itself into a permanent source of power and public utility.

1,301. (III.) Changes in organization.—It seems necessary, at the outset, to expose the fallacy of the general impression that the Public Works Department establishment is unduly expensive, and that more or less drastic measures are imperative in order to effect a speedy curtailment. Indeed, the problem before this Administration is not how to reduce the superior establishment, but how to reinforce it. The phenomenal increase in the outlay on works, and the poorness and inadequacy of the staff, have thrown an undue strain on all ranks of the

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Public Works service. Marked attention has occasionally been drawn to the fact that facilities for communication by rail and road have rendered supervision a matter of comparative ease. It has to be borne in mind that these facilities have themselves brought in their train added responsibilities and increased outlay. The burdens of construction and of preservation have by no means been lightened; they are growing apace as the sub-joined tables will show. While the outlay on the con-

struction and upkeep of roads and buildings has advanced four-fold and eight-fold respectively since 1900, the length of road maintenance has increased two-and-a-half times since 1896. The figures abundantly illustrate the restless activity in the midst of which the Public Works Department officer has failed to derive any substantial relief, or alleviation from the improved facilities for communication, or from any other source whatsoever.

TABLE NO. I.

Outlay on Provincial Roads and Buildings since 1900-1901.

YEAR.	OUTLAY ON ROADS.			OUTLAY ON BUILDINGS.			REMARKS.
	Original Works.	Repairs.	TOTAL.	Original Works.	Repairs.	TOTAL.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1900-01	1,24,644	5,24,648	6,49,292	1,20,994	1,06,202	2,27,196	Increase in roads: 4 times and in buildings: 8 times.
1901-02	4,14,490	5,97,528	10,12,018	3,10,944	1,27,926	4,38,870	
1903-04	4,55,157	7,73,902	12,29,059	7,67,044	1,34,970	9,02,014	
1904-05	Not available.						
1905-06	4,58,680	7,41,058	11,99,738	11,23,630	1,30,428	12,54,056	
1906-07	8,09,470	11,67,413	19,76,883	14,83,117	1,97,659	16,80,776	
1907-08	12,75,588	14,02,521	26,78,109	15,10,505	2,24,991	17,35,496	
1908-09	21,65,971	15,18,496	36,84,467	10,79,348	2,32,016	13,11,364	
1909-10	14,37,048	13,53,481	27,90,529	12,46,253	2,02,321	14,48,574	
1910-11	9,44,167	14,61,719	24,05,886	14,70,742	2,24,722	16,95,464	
1911-12	8,85,678	15,12,357	23,98,035	15,20,574	2,34,306	17,54,880	

TABLE NO. II.

Length of roads maintained by the Public Works Department according to the road schemes of the province since 1896.

Road scheme.	Class I roads.	Class II-A roads.	Class II-B roads.	Class III roads.	Total length.	Total length in charge of the Public Works Department.	REMARKS.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	
1896	825	527	1,655		3,007	2,153	Increase in length of road maintenance $2\frac{1}{2}$ times.
1899	1,188	960	1,850		3,992	3,006	
1902	1,352	1,319	1,635	872	5,178	3,945	
1911	2,539	1,700	1,062	838	6,139	4,910	

(2). In the second circle of superintendence there were 8 imperial and 3 provincial Executive and Assistant Engineers, i.e., 11 permanent engineer officers altogether in December 1903. Ten years afterwards, there were only 6 permanent officers, viz., 4 imperial and 2 provincial. While the expenditure in this circle in 1904-05 was only Rs. 11,14,507 including establishment charges it mounted in 1912-13 up to Rs. 26,57,544 exclusive of establishment charges. That is to say, while the expenditure had

grown three-fold, the permanent strength of the superior establishment had shrunk to one half. Taking the province as a whole, the sub-joined table exhibits the variations in the outlay on buildings and roads, and in the permanent strength of the superior establishment, excluding Chief and Superintending Engineers, during the last 20 years or so (as far as I have been able to make out).

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YEAR.	EXPENDITURE ON BUILDINGS AND ROADS (EXCLUDING IRRIGATION).	PERMANENT ENGINEER ESTABLISHMENT OF BUILDINGS AND ROADS (EXCLUDING CHIEF AND SUPERINTENDING ENGINEERS).		
		Imperial.	Provincial.	TOTAL.
	Rs.			
1892-93	17,46,205	19	Nil	19
1898-99	16,47,894	14	3	17
1904-05	33,34,674	25	5	30
1910-11	54,91,980	19	10	29
1913-14	67,50,000	12	10	22
	(Budgetted)			
1914-15	70,00,000	..	..	..

The year 1892-93 marks the position of the province as it stood before the amalgamation of Berar; the figures for 1904-05 illustrate the combined position of the Central Provinces and Berar as regards expenditure and establishment in what may be called their inaugural year; and the year 1913-14 indicates the depletion of the superior staff resulting from the readjustment of establishment necessitated by the increasing demands of irrigation. The net result has been that while the outlay in the Buildings and Roads Branch has increased four-fold during the last 20 years, the permanent strength of the engineer establishment has remained practically stationary. Some idea of the extensive areas over which the Executive Engineers have to traverse may be formed from the figures given below for divisions in the Second circle :—

Public Works Department Division.	Area in Square Miles.	REMARKS.
Eastern Division	12,796	Raipur and Drug districts.
Plateau Division	11,663	Seoni, Chhindwara and Betul districts.
Jubbulpore Division	10,705	Jubbulpore, Saugor and Damoh districts.
Hoshangabad Division.	9,880	Hoshangabad, Narsinghpur, and Nimar districts.
Bilaspur Special Charge (Temporary).	7,269	Bilaspur district.
Mandla Division	8,044	Mandla district.

The sub-divisions which usually coincide with the civil districts are in their way equally extensive and vary from 3,000 to close upon 5,000 square miles, for example :—

	Square miles.
Chhindwara sub-division	4,631
Saugor sub-division	3,962
Nimar sub-division	3,929
Betul sub-division	3,826
Drug sub-division	3,807
Seoni sub-division	3,206
Damoh sub-division	2,831

(3). In considering the suitability or otherwise of the Public Works Department organization, there seems to

be a growing tendency to seek for a model in the English institutions. The circumstances prevailing in the two countries are not exactly parallel, and in the comparison of the two systems sufficient allowance is not made for the peculiar meteorological phenomena visible in India and their effects on the condition of the people and the constitution of the Public Works Department. The maintenance of a fully-panoplied standing army is as essential for defending the shores of India against a foreign enemy as the upkeep of a fully-equipped Public Works staff for protecting the country from the ravages of famine whose periodical visitation remains one of the unsolved problems and mysteries of meteorology. The ruinous expenditure of the great famine of 1896-97 was not repeated in the unprecedented famine of 1899-1900. And the famine policy of Sir Reginald Craddock which achieved so large a measure of success would perhaps not have been contemplated, had it not been for the presence of a veteran staff ready to follow up and carry out that policy. The ever-present apprehension of scarcity and distress imposes limits upon the organization of the Public Works establishment which cannot be transgressed without perilous consequences. An army of men capable of dealing with the difficult and complicated situations arising out of a famine cannot be raised at a moment's notice. As pointed out above, the phenomenal increase in the outlay on works has not been accompanied by an increase in the executive staff in a corresponding degree. If this economy in the upkeep of staff is to be preserved without destroying either its efficiency or its elasticity in times of sore trial, the goal is not to be reached by the substitution of private for departmental agency to any great extent, but by utilizing in considerable measure indigenous in place of foreign agency, the practicability of which has been brought about by the beneficent policy of education steadily followed by the Government of India. The problem is, therefore, one which lay in the domain of the Public Services Commission, and it seems unnecessary here to repeat the arguments that have been already laid before that tribunal.

(4). One of the most lamentable features of the Public Works Department organization is the gradual disappearance of the old type of "mistri." That type has been displaced generally by a class which neither possesses hereditary skill and knowledge, nor exhibits any keenness to learn or to strive for a reputation in practical workmanship. This evil has been the necessary outcome of the over-education of the "lower-subordinates." Compare the standard prescribed by any engineering institution for this class of subordinates with that laid down in paragraph 186 of Public Works Department Code, Volume I, for the higher ranks of upper subordinates, and the true cause of the evil will at once become apparent. With a somewhat extensive book knowledge, but without any practical instinct or experience, the sub-overseer has often deemed himself immeasurably superior to the poor uneducated "mistri" from whom even engineer officers of high repute have in the past learnt practical lessons of value. The result has been that the place of the real old "mistris" has been usurped by the poor relations or protégés of unscrupulous and overweening petty subordinates. In this province, there was to my knowledge not one really good mistri on whom I could lean with the same confidence as I did when I worked as an Assistant in Rajputana. The revival of that fine type of real work-agent, or the creation of a new class of work-agents in the so-called "lower subordinate establishment" is a question which urgently calls for solution. There are and have been, no doubt, many excellent lower subordinates, some of whom have risen to the highest rank of sub-engineer. Their place, strictly speaking, was from the very outset among the "upper subordinates," for which class both by birth and education they were truly fitted.

(5). The numerous memorials submitted to the Government of India by the "upper subordinates," have been the outcome of the discontent created not so much by any peculiar hardships involved by the conditions of the service to which the memorialists belong, as by the

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superiority of position enjoyed by the members of other cognate services. The mere improvement of the pay of the upper subordinate service, without bringing that service into line with other similar services of the province, would leave the essence of the problem untouched. The organization of that service has, indeed, outgrown the rudimentary circumstances and stages which brought it into being; and after the lapse of over fifty years it seems but natural that the need for co-ordinating it to other services, which have grown up simultaneously, should begin to be felt. While the lower end of that service presents a somewhat nebulous body scarcely distinguishable from the staff of petty subordinates, surveyors and work-agents, its members gradually soar higher and higher above the subordinate regions until they occupy positions of trust and responsibility side by side with Assistant Engineers of the superior executive service. And yet, save in exceptional cases, these men do not emerge from the subordinate ranks, even though in some instances an honorary embellishment lifts them to perhaps a little higher but somewhat dubious position. The solution of the difficulty seems to consist in a re-classification of the upper subordinates of the Public Works Department, so as to bring them up to the status of men of similar functions and qualifications in other departments. Let us take the Forest service, for example. There are rangers from Rs. 50 to Rs. 150 per month. Above this pay the officers are carried at once into the superior provincial service, and they are graded as "officers of the provincial service," with pay ranging from Rs. 200 to Rs. 850. Likewise, there are *naib tahsildars* from Rs. 60 to Rs. 100, rising to *tahsildars* from Rs. 150 to Rs. 250, above whom come Extra Assistant Commissioners, who occupy the upper ranks of the provincial civil service, with pay ranging from Rs. 200 to Rs. 800. It will thus be seen that, whereas men in the Public Works Department drawing anything up to Rs. 500 and performing the duties of Assistant Engineers are classed as "subordinates," men in other departments drawing upwards of Rs. 200 are ranked as officers of the provincial service. Herein lies the sting; and what the Public Works Department upper subordinate aspires to is not better pay and allowances so much as dignity and importance in the eyes of the public.

(6). In 1907, the Government of India called attention to the fact that in course of time the sub-divisional officer had become the real executive and the Executive Engineer had become in a manner a Superintending Engineer. This upward process has followed its logical course with the result that the upper subordinate has taken the place of the Assistant Engineer, and the lower subordinate has usurped that of the upper subordinate, or even of the Assistant Engineer. Generally speaking, sub-overseers instead of merely helping and carrying out the orders of the responsible Assistant Engineer or experienced upper subordinate, are in more or less independent charge of the management of important and scattered works themselves. The remedy for this unfortunate state of affairs lies in a thorough reorganization of the Public Works Department staff, both superior and subordinate, and in a suitable readjustment of burden between rank and rank. We must, then, build up from below and re-lay the foundations of the subordinate service, before proceeding to remodel the superstructure of the superior service. In the first place, it is necessary to sub-divide sub-overseers into two distinct classes: (a) *work-agents*, for the execution and supervision of construction and repairs and the upkeep of initial accounts; and (b) *surveyors and estimators*, for the preparation of projects inclusive of field and in-door work. The forced union of these two functions has been fatal to the best interests of the Department; it has led to over-education, over-efficiency, over-crowding of duties; it has created discontent without serving the true ends of economy. The training of these men, both theoretical and practical, should be just sufficient for the due performance of their tasks and no more; their pay and emoluments remaining just as they were before. Over these would come *super-visors* who would be the sole representatives of the old "upper subordinate" class; they should be capable of

fulfilling both the functions (a) and (b) and possess higher theoretical knowledge and technical skill in order that they may exercise a thorough control over the work-agents and surveyors, and at the same time render substantial help to the engineer in charge. Their training ought, in fact, to be so regulated that they may prove valuable subordinates to engineer officers, and not aim at becoming eventually their rivals or confrères. These supervisors would begin on Rs. 60 to Rs. 100 and rise up to Rs. 250, and no higher.

(7). There has been a good deal of misapprehension and uncertainty regarding the position of the provincial service. It is not clear whether the functions of the provincial service are regarded as being equal in quality and responsibility to those of the imperial service or if that service must be recognised as being distinctly inferior. The speeches of Sir William Muir of November 1873, and of Sir Antony Mac-Donnell of November 1900, extracts from which figure so largely in the memorials of provincial engineers, have led the students of the Roorkee College to believe that the institution has been recognised as one which imparts instruction, both theoretical and practical, up to the standard of any similar institution in Europe, and that the late Cooper's Hill College was never intended to affect in any degree the relations of the Government of India with the former seminary. The Government of India Resolution No. 2112-G. of 1892, introducing the provincial engineer service, moreover declared that, except in the matter of pay, leave and pension, "there shall be no distinction between the members of this service and those of the imperial service." To quote the words of the Imperial Gazetteer (Volume IV, Chapter X, page 320), "its members perform the same duties, and can rise to the same position, as their imperial confrères, but draw a lower rate of pay in all grades except that of Chief Engineer, in view of the permanent Indian connection." Not long ago, it was notified that an officer recruited from European seminaries should be considered fit for the executive charge of a division after 8 years' service, and that an officer recruited from the Indian colleges might be deemed fit for the same responsibility after 15 years (or any other longer period). To lay down a sharp distinction like this is to brand the provincial service as distinctly inferior. It would simplify matters if the provincial service were declared as the lower level of superior service, the members of which would perform duties no higher than those of Assistant Engineer. In fact, they might then fitly be classed as "Extra Assistant Engineers," their status being similar to that of the provincial civil service.

(8). It is, indeed, desirable that all superior services should, as far as possible, be modelled on the same lines. The superior service of the Public Works Department may, then, be divided into two branches:—

- (A) *Imperial* for the higher executive and administrative appointments corresponding to the covenanted civil service;
- (B) *Provincial* for all the other executive appointments corresponding to the provincial civil service.

(9). The imperial engineer will be recruited partly in India, and partly in England in the proportion of 2 to 1 that is to say two-thirds of the number of vacancies in every year will be filled by recruitment in India and one-third in England. From the Government of India Classified List (corrected up to 30th June 1912), it would appear that out of a total of 203 engineers recruited in India 100 were Europeans, and 103 Indians. There is no likelihood of Indians swamping the Department as the proportion of Indians and Europeans among the local recruits will be about equal, and the total European element in the imperial service, including European officers drawn from England as well as those drawn from India, will always remain at a high level. The recruitment will be by means of an open competitive examination, which has always been the rule in the Indian colleges and which was also the rule in the Cooper's Hill College. There should be no nomination or selection in any form. There should be certain recognised engineering colleges

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and Universities in Great Britain and Ireland and in the Colonies, graduates or superior diploma holders from which (provided they are His Majesty's subjects), may be admitted to an open competitive examination held in London every year. Similarly, there should be certain recognised colleges in India graduates from which (including subjects of native states) may be admitted to an all-India open competitive examination held in Delhi every year. Appointments will be made, in both cases, from the successful candidates in the order of merit, to the extent of the number of vacancies during the year. The examinations held in London and in Delhi need not be exactly simultaneous; the standard of both the examinations must be identical, and they should be held about the same time. This will practically be a revival, in a modified form, of the old system of recruitment from Cooper's Hill and Roorkee. In assigning the age-limits, however, the rules and regulations of Indian Universities must be persistently kept in view. There are many instances in which the strict observance of University regulations in the case of Indian recruits, and the absence of any such rules in the case of European recruits have resulted in serious loss of service in the case of the former. The Indian has to master a foreign language to begin with, and if the European, who does not labour under this initial disadvantage, is deemed fit for service at a younger age than the Indian, then it is obvious that the age-limit for retirement cannot be made identical in both cases without depriving the Indian of the full length of service as well as of the ultimate rewards of higher appointments.

(10). Provincial engineers should be wholly recruited in India. Each government will recruit direct from the engineering college within the province, or, in the absence of a local college, from the engineering colleges in the neighbouring provinces, to which local students may be encouraged to go, with a view to compete for the Public Works services. Appointments should be made, in the order of merit, from the successful engineering graduates, to the extent of the number of vacancies during the year. In order to give an opportunity to the successful candidates of the year to compete in the examination for the imperial service, the provincial recruitment will take place after the results of the former examination are declared. The provincial engineers will be placed on the same footing as the provincial officers of other departments, and styled Extra Assistant Engineers, similar to the Extra Assistant Commissioners and Extra Assistant Conservators of Forests. The present grades of sub-engineers in the Public Works Department would in this way be entirely abolished, and merge into the class of Extra Assistant Engineers.

(11). In reorganizing the staff, on the lines indicated above, two main guiding principles must be steadily kept in view. In the first place, there must be no promotion from class to class. To further the cause of economy, and to repress all feelings of jealousy and discontent, nothing is more essential than to render the classification absolutely rigid and inflexible. Whatever the evils of the caste system might be, it certainly has this advantage that it presents clear-cut spheres of activity and places aims and aspirations with unmistakable preciseness before all concerned. No subordinate shall aspire to be an officer, and no provincial officer shall aspire to be imperial, in the same way as no *Sudra* shall aspire to be a *Brahmin*. The training and equipment of each class must be so regulated as to banish all idea of advancement from one class to another. There will be promotion from grade to grade, but there shall be no elevation from class to class. Secondly, in determining the strength of each class of staff, attention must be exclusively paid to the permanent needs of the Department, as opposed to those created solely by the multiplication of works. The provisions of Code I, paragraphs 795 and 796 should be amended and amplified, so as to remove unnecessary restrictions upon the employment of "works establishment," and to ensure that any normal expansion of works may be met by an adequate provision for the requisite staff in the sanctioned estimates for works. Engineers and subordinates temporarily engaged for the sole pur-

poses of a work, or group of works, would be a legitimate charge against the works concerned. For this class of staff, there is no reason why a permanent burden should be laid on the public revenues. The "works establishment" would become quasi-permanent if they were systematically kept on and transferred from one work or district to another, according to requirements. Any expenditure on the "works establishment" would thus be debitable to works; its existence, continuance, growth or cessation being entirely dependent on the works themselves.

(12). The present organization of the Public Works Department staff, and the lines on which it might be reconstructed have been already explained above. It remains now to give some rough idea of the scale of establishment likely to be required in a province like the Central Provinces. Each civil district will represent the executive unit of this Department, and the departmental charge of superintendence will coincide with the civil division. The imperial establishment, which will be borne on an all-India list, will thus consist of one Chief Engineer, five Executive Engineers and seven Assistant Engineers. The Chief Engineer will also be the Secretary to the Administration in the Buildings and Roads Branch and will draw a salary of Rs. 1,750 to Rs. 2,000 per month. The five Executive Engineers will hold charge of divisions, coterminous with those of the Commissioners. Their functions and powers will be the same as those exercised by Superintending Engineers at present. Their scale of pay will be the same as before, with the exception that the maximum limit will be raised from Rs. 1,250 to Rs. 1,500. Of the seven Assistant Engineers, one senior officer will hold the appointment of Under Secretary, which will form the training ground for higher appointments, and four will hold executive charge of the more important districts, their status being exactly the same as that of the present Executive Engineers. The remaining two Assistant Engineers will be either working as junior Assistants in one of the executive charges, or placed on special duty for the execution of works of particular importance. Their scale of pay will remain unchanged.

(13). The whole of the remaining staff will be on the provincial list; their appointment and promotion being entirely in the hands of the local Administration. After allotting four districts to imperial engineers, out of the 22 districts in these provinces, 18 will constitute executive charges to be held by Extra Assistant Engineers. They will draw a scale of pay ranging from Rs. 250 to Rs. 1,000, the more senior men being placed in charge of the more important districts. To each executive charge will be allotted one or more supervisors, according to its importance, together with the necessary staff of work-agents and surveyors and estimators, there being ordinarily not more than two to three of each class of subordinates in a district. Any additional staff that may be required to cope with the works sanctioned for the district will be entertained as a charge against the works, in the manner already indicated. In addition to these district charges, the need will doubtless arise, from time to time, for special charges for undertaking extensive works and surveys, beyond the normal programme of the province. These charges will be manned similarly, the requisite staff when in excess of the permanent establishment being met from the provision for "works establishment" in the sanctioned estimates for the works and surveys concerned.

1302. (IV.) Relations with other departments and sub-branches.—All large sanitary works in these provinces, some of them demanding the highest engineering skill and expert knowledge, have been carried out, and are being maintained, by the officers of the Public Works Department. The success of the schemes is perhaps not altogether unknown to the Government of India. The difficulty experienced in the past has arisen not from any want of skill, or expert knowledge, but from want of a sufficient number of officers in the ranks of the Public Works Department. The special task of investigating, maturing and executing important sanitary projects has had to be performed, in addition to the arduous duties of an ordinary executive division. Past experience indicates the necessity, not so much of the organization of a

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special service, as of strengthening the existing staff for the purpose. Nor must it be overlooked that it is only a very few and very large and wealthy municipalities who can think of undertaking works on a very extensive scale. Such municipal bodies are capable of looking after themselves and calling in the aid of the requisite advice from Europe, where more than Indian knowledge and experience is absolutely needed. The vast majority of the municipalities, however, who are more or less dependent on government support, require less ambitious schemes to supply their much humbler needs. These smaller municipalities have to be substantially helped in some form or other by government, and the Public Works Department is called upon to carry out and maintain works for them, free of charge, in the ordinary course. Moreover, this branch affords abundant scope for the employment of private agency. There are many distinguished European firms who are ready at any time not only to carry out, but also to furnish designs for large sanitary undertakings. Several water-works schemes in these provinces have been successfully carried out by such firms, including the supply of engines, boilers, pipes and fittings and all other materials and appliances. There does not appear to be any justification, therefore, for the establishment, or continuance, of any special branch of Public Works, for the design and execution of works of this nature.

(2). These remarks are applicable to architectural and electrical works as well. Several engineering firms have made a speciality of electrical engineering and such firms have highly-paid European architects in their service, who prepare suitable plans and estimates for works carried out by them. The offer of substantial premiums, moreover, has in many cases secured excellent designs for town halls, colleges and residences for the richer classes in the presidency towns and elsewhere. The Canning College of Lucknow was, I think, the first institution of the kind which attracted private talent to this path, and, if I remember aright, the prize was won by an Indian draughtsman of Roorkee. Any extension of the Public Works service in these directions would unnecessarily lead to over-departmentalization, and the multiplication of heads of expert departments, on a scale of expenditure not warranted by the circumstances. In this respect one might derive some lessons of value from the Medical Department. No one ever thinks of attaching eye experts, throat experts and other medical specialists to the Government of India, or to the local Governments. They are where they should be, viz., in the Medical College. In Calcutta, for instance, where there is ample demand for expert advice and research, the public at large profits by the presence of medical specialists in the Medical College, which at the same time furnishes abundant training ground for the medical students. One often hears of the undesirability of locating such training institutions amidst the temptations of thickly populated cities. Medical colleges ought properly to be in the midst of disease, and although the proximity of objectionable surroundings cannot be altogether overlooked, it must at the same time be remembered that the students enter these colleges after finishing their university course. It must, indeed, be regarded as a part of their training that they should at this stage realize the existence of evil influences, mastery over which is one of the most essential qualities for the success of their future professional career. The true artist draws his inspirations from undraped life and nature; and the real test of the efficiency of such an institution must be—whether it is capable of producing a “*Svangili*” or a “*Little Biller*.” Similarly, the engineering colleges should be in the neighbourhood of the centres of activity, created by the co-operation of labour and capital, in the premier cities of India, and in touch with all the bustle and squalor inseparable from the life of an engineer. And their professors must be drawn from the most distinguished specialists in sanitation, architecture, electrical engineering, etc., whose services would thus be available to government as well as the public at large.

1,303. (V.) Decentralization.—The policy of decen-

tralization enunciated by the Government of India in 1907, and the subsequent recommendations of the Decentralization Commission, have succeeded in effecting much needed reform in the administration of the Public Works Department. They have readjusted and subdivided labour more suitably than was the case before; and helped to promote unison of effort, with enlarged spheres of action, in all ranks of the Department, and to secure a considerable measure of freedom from non-essential restrictions. In order, however, to bring the efficiency of the Department nearer the ideal in view, it seems essentially necessary that the Superintending Engineer should exercise fuller powers in dealing with projects which have been administratively sanctioned, or assigned a definite place in the final issue of the budget and in disposing of the funds allotted for their execution. He should be subject to less restraint, not only in sanctioning works and accepting contracts, but also in granting funds and reappropriating them from one work to another, so long as the budgetted programme of the year is not unduly deviated from. In the matter of minor works and repairs, the Executive Engineer should relieve the Superintending Engineer of all but financial responsibility. The Executive Engineer should have power to sanction and execute all minor works and repairs within the limits of specific allotments made by the Superintending Engineer for the purpose. The Executive Engineer should also be empowered to deal finally with the minor works requirements of Commissioners and Heads of Departments, in consultation with them, and within the limits of the grants placed by the local Administration at their disposal. Relief is urgently called for in the disposal of matters connected with establishment, and tools and plant. The effects of centralization are most felt in this direction and greater latitude must be allowed in making appointments and promotions, granting leave and allowances, purchasing tools and plant and disposing of unserviceable articles, which usually involve a large amount of correspondence often of a petty nature. And the restrictions laid down regarding the supply of English stores, except through the India Office, should be removed as early as possible. It may, perhaps, be explained, here, that the amount of lapse at the end of the year does not represent the mere excess of grant over expenditure, it affords in considerable measure a direct indication of the preponderance of savings over excesses on sanctioned estimates and allotments. In other works, the keener the effort in the course of the year to confine outlay within the limits of sanctioned estimates and allotments, the greater the accentuation of this preponderance. And when these savings are spread over numerous works, the exact determination of their amount in each individual instance before the final adjustment of accounts becomes one of great difficulty. Such savings do not constitute lapses in the sense that they impose an additional burden on the next year's budget, and, as they begin to accumulate towards the close of the year, they should be at once released, by reappropriation, for expenditure on other useful objects during the year. It is for this reason very necessary that the Superintending Engineer and the Executive Engineer should be delegated authority to balance minor items of short expenditure by increased outlay on other works in progress by re-appropriation. Re-appropriation statements submitted to, and sanctioned by, the local Administration in February and March do not absorb all petty savings which occur late in the year, and this decentralization of authority would tend to minimize the lapses at the end of the year, the recurrence of which is the cause of so much correspondence and complaint.

(2). The delegation of powers in these respects has not been on very liberal lines. For example, the Superintending Engineer, whose pay and emoluments amount to something like Rs. 30,000 per annum, is not authorized to sanction the construction of roads costing more than Rs. 10,000, and the Executive Engineer has been deemed unfit to dispose of minor works whose value exceeds his pay for two months, viz., Rs. 2,500. If this is to be the decentralization of the future, we might as well return to the over-centralization of the past. It would be impossible

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for the Public Works Department Re-organization Committee to deal exhaustively with so comprehensive a subject, for that would involve taking up the Code chapter by chapter and examining and amending all its detailed provisions. The Decentralization Commission laid down the general principle that while the provincial governments must be allowed full discretion in delegating powers of professional sanction to their subordinate officers, they should bear in mind that the position of a Superintending Engineer ought to be that of a local Chief Engineer, for most engineering matters within his circle, and that the function of the Chief Engineer of the province should be to deal with the estimates of really important works, and to satisfy himself, by local inspection, that the engineering establishments under his control are working economically and efficiently. The Commission, moreover, remarked in regard to the Code as a whole, that they had received complaints as to the unnecessary stringency and complication of a number of its rules, and that the Public Works Secretary to the Government of India had admitted that a thorough revision of it would be desirable, though he said that his Department could not at the time spare the staff which would be required to carry this out. Nothing has been done since to revise the Code and place it on a really business-like and satisfactory basis. Nor has any decentralization been attempted in the accounts rules, which interfere in the details of executive management of works to an extent which is often irritating. To quote the words of a high authority, "the system is exceedingly elaborate, and simplification and devolution seem to be clearly indicated." It is of the utmost importance, for example, that the Executive Engineer should have absolute and unrestricted control over his accountant (Code I, paragraph 372). The duties of the accountant are in no sense those of an audit officer sitting more or less in judgment upon the Executive Engineer and his Assistants. He is not there as something detached from the divisional machinery; he forms a component part of that machinery. Let the Audit Department throw the whole responsibility on the Executive Engineer by all means. I do not imagine that any Executive Engineer would think of shirking his responsibility in the matter of accounts, simply because the burden falls partly on the shoulders of the accountant. In the interests of strict discipline in particular, and of good management in general, it would be far preferable for the Audit Department to hold the Executive Engineer himself answerable for his accounts rather than his accountant; real and effective control can only be secured by dispensing with the present duality. The spirit of decentralization must permeate every nerve and muscle of the Department, in order to pull down red-tape from its exalted pedestal and to instal, in its place, an all-embracing economy of time and labour.

1,304. (VII.) Education.—We may now pass on to the consideration of the educational institutions for the supply of engineers for the public as well as private service. The latest report of the Indian Student's Department in England says:—"It may well be that the only permanent solution of the student problem lies in building up in Indian Universities industries and institutions adequate to give her sons all the training they require." That is not exactly the sort of solution which India is waiting for. The people of India have begun to realize that there is such a thing as over-education. The supreme necessity of the hour is, not more education, but more employment. The spectacle of an extensive and highly skilful system of canals, without any land for irrigation within measurable distance, would not be more dispiriting than that presented by the establishment of the most elaborate system of education without any avenues of employment. The engineering colleges of India have thoroughly justified their existence, so far as training is concerned. That they have failed to be otherwise useful is not because their organization is defective, but because neither government, nor private firms, offer an adequate field for the profitable use of all that training. For subordinates, no doubt there is a fair scope, but the more highly-trained engineers have, with few

exceptions, no chance in the Public Works Department, and the great engineering firms do not give them any encouragement whatsoever. These colleges are fast losing their attractiveness, and the best intellect of the country is wandering aimlessly in other directions. Of what avail, then, is an institution like the Roorkee College which has acquired a world-wide reputation, if there is a market for only some four or five of its superior products in a year? One might as well import and establish the most up-to-date machinery for manufacturing the finest silk creations, when a demand exists only for the coarsest jute fabrics. If this unfortunate state of things is to continue, it would serve a more useful purpose to appoint a committee similar to the Royal Indian Engineering College Committee of 1903, for the abolition of the engineering colleges, than to discuss the possibility of their further improvement. Let the opportunities of livelihood be thought of first; everything else will follow in its logical course afterwards. It is not by the provision of more and more highly-finished education alone that India will learn to spell life with different letters.

1305. (VIII.) Practical training.—The imperial engineers (proposed above), after appointment, should undergo a course of practical training for two years on some large construction works. Those recruited in India must spend the whole period of their training in England, and those recruited in England will spend the first year in England, and the second in India. The training in England may be conducted by a stipendiary Superintendent appointed by the Secretary of State, who will act under an Advisory Board consisting of one of the Indian Members of the India Council as President, and three members (all appointed by and receiving an honorarium from the Secretary of State) as follows:—

- (1). One member of the Council of the Institution of Civil Engineers;
- (2). One retired engineer officer of the Public Works Department not below the rank of Superintending Engineer; and
- (3). One engineer officer of the Public Works Department, of not less than 15 years' service, on long leave in England.

It will be the Superintendent's duty to arrange to article each recruit under a professional engineer, who will afford him every opportunity of training himself on large construction works. The training, in India, for the English recruit should be similarly arranged by the Chief Engineer of the province to which he may be posted. The question of the practical training of Indian engineer students in England has been fully dealt with in the Report of the Committee appointed by the Secretary of State to inquire into the system of State Technical Scholarships established by the Government of India in 1904, and the remarks and recommendations of this committee are already before them. The Indian students in England are placed in a most difficult and embarrassing position, owing to the absence of proper facilities for acquiring practical experience of the methods of construction and management of important engineering works. Adequate relief in this direction can only be afforded by some such Advisory Board as the one suggested above. It would be helpful to the Secretary of State, in watching the interests of the Indian students and providing them with the requisite training. The two measures, indicated by the committee (paragraph 54) *viz.*, appeal to the patriotism of British manufacturers, and pressure upon the firms holding contracts from the India Office, could in this way be systematically and effectively applied. I would even go further than the committee; it should be possible for the Secretary of State not merely to express his desire to obtain practical training for Indian students *after* the contracts have been settled, but to make the fulfilment of this object a condition of such contracts *before* they are entered into. A good deal of influence could also be exercised through those consulting engineers at home who have spent part of their professional career out in India. Distinguished men like Sir Alexander Binnie would probably be only too glad to extend their helping hand to the Indian students. Similarly, as regards engi-

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neer students in India, who fail to obtain government appointments, Mr. Brereton's suggestion (paragraph 69) to allow engineers of the Public Works Department to take a certain number of premium-paying pupils in India is a sound one. The State railways, as well as company-owned railways and contracting firms in India, moreover, should be of great assistance to the Government of India in giving suitable training here. The Government of India are making every effort to stimulate Indian industries by the purchase of stores of Indian manufacture, and all Indian firms should cordially co-operate with them in raising a corps of experienced engineers to meet the needs of private agency. In order to safeguard the interests of the students still further, it may be laid down as a strict rule that no firm in India shall be brought on to Schedule A (List of firms approved by the Government of India) *vide* Appendix 30 to Public Works Department Code, Volume III, unless that firm gives an undertaking that it will allow a specified number of young men the desired practical training. Lastly, government might encourage the students by granting a number of scholarships in each province, tenable for two years, until the system of practical training is established in due course on a stable and satisfactory footing.

1,306. (Conclusion.)—Enough has, I hope, been submitted above to establish the importance of retaining the individuality of the Public Works Department strong and unimpaired. On this ground-work alone could any development or reorganization of the Public Works machinery be securely based. The Department has borne the burden and heat of the day for a long series of years,

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1,307. (President.)—The witness stated that he was formerly a Superintending Engineer of the Public Works Department having retired in February 1915.

1,308. He considered that the working of the Department would be much improved if projects were sanctioned earlier than was the case at present, as it had been his experience that projects were often not sanctioned in sufficient time to allow the Public Works Department to get out proper plans and estimates. In the Central Provinces the programme of works was settled at the Pachmarhi Conference. One of the rules of the conference was that no work should be included in the budget which had not received administrative sanction, and this meant that plans and estimates ought to have been prepared before the works were included in the budget. Unless some old sanctioned estimates were available for inclusion in the budget this rule could not be carried out in practice, as the programme was not settled sufficiently far ahead. He knew of a considerable number of major works which had been carried out without plans and estimates.

1,309. He suggested that Stage I estimates should be much more carefully considered than they were at present. It was due to proper care not being exercised in Stage I that revised estimates had to be submitted so often, and that the amount of the final estimate often varied so largely from the Stage I estimate. For instance, if at Stage I, it was not known what the foundations of a building were likely to be the Administration might, when the estimates were finally prepared, be committed to much larger difficulties than originally contemplated. That was, however, the fault of the Administration, and not of the Public Works Department, as the latter did not get sufficient time to prepare the estimates. The other administrative departments put an unnecessary amount of extra work on the Public Works Department by not making up their mind sufficiently far in advance as to what they actually required; they called for the Stage I estimate and then proceeded to suggest additions and alterations with the result that plans and estimates had to be prepared again and again. The only remedy was to settle the programme of work sufficiently far ahead as suggested in his written evidence, and give the Public Works Department plenty of time to examine the matter. Often other departments failed to give their requirements in sufficient detail and sometimes even the site was not

and its operations have been characterized throughout by efficiency, economy and adaptability to surrounding circumstances. Improvements in its methods are doubtless necessary, but in giving effect to these care must be taken not to lower its constitution below the limit of security dictated by the periodical visitation of famine. For the introduction of greater economy in its methods, indigenous agency should be substituted largely for foreign agency in all ranks of the Department. This is, indeed, the essence of reform in all departments of the public service. Whatever the position of other departments may be, certain it is that so far as this Department is concerned, the children of the soil possess "partly by heredity, partly by up-bringing and partly by education," the knowledge, equipment and ability which are essential for the task. The advent of the Committee is fraught with the weightiest meaning in respect of the future of the Department, and of the people alike. And it is devoutly hoped that the recommendations of the Committee will lead to the gravitation of the educated classes in the direction of public works, and of supplying material for the recruitment of departmental agency as well as for the establishment of private agency, on co-operative principles. The loyal heart of India has been profoundly stirred by the speech just delivered by the Viceroy at the Convocation of the Calcutta University. The policy indicated in that speech of opening up avenues of employment, and turning the dormant energies of the rising generation to the practical good of the people is symbolical of the high purpose and spirit of British rule in India.

selected. Sites were supposed to be selected by a committee which, however, it was very difficult to convene. The consequence was that either the head of the department or the Executive Engineer selected a site, and this was accepted by everybody else. As an example, he stated that whenever the District Superintendent of Police went out on tour, he marked out certain sites for his buildings and a memorandum was then drawn up and circulated to the members of the committee who signed and accepted it. The whole difficulty would be solved if at the Pachmarhi Conference it were laid down what works would be taken up in the year under consideration, and what were likely to be taken up in the following year.

1,310. There had been a great expansion of work in the province, but the staff had not been increased correspondingly. He had pointed out in his written memorandum that the net result had been that while the outlay in the Buildings and Roads Branch had increased four-fold during the last twenty years, the permanent strength of the engineer establishment had remained practically stationary. He considered that the superior staff was not sufficient for the amount of work which it was required to do, and suggested that it should be strengthened.

1,311. The witness had been connected with every famine which had occurred during the last twenty years, and considered that the Public Works Department staff was insufficient to cope adequately with famine works, and that it should be increased to enable it to deal with such contingencies.

1,312. He contended that the real *mistri* class had absolutely disappeared. The *mistris* employed on the works were not real *mistris*. This disappearance he attributed to the lower subordinate, who having a good deal of theoretical knowledge, and considering himself to be a superior class of being, did not want to have a *mistri* who knew a great deal more about practical work than he, and hence could point out his mistakes. The lower subordinates generally managed to get such *mistris* dismissed by constantly bringing complaints against them. What actually happened was that the sub-overseer went to his work with a certain amount of theoretical knowledge and issued orders; the *mistri* then told him that his orders were impracticable and that the work must be done in a different way. The lower subordinate, who wanted to be the manager of the whole work would not

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tolerate such interference, and this was the reason why the *mistris* were dispensed with. The lower subordinate he thought, got more theoretical training than was necessary for his work. He had no knowledge of the curriculum of the Engineering School at Nagpur, but was acquainted with the Jubbulpore school and had conducted its examinations for five years. He considered that the theoretical training imparted there was too high.

1,313. He proposed that the lower subordinate staff should be divided into two classes (1) works-agents, and (2) surveyors and estimators. Both classes should be on the same rates of pay. There should not be two separate branches, but their training and qualifications would be different. The works-agents would have to be trained in engineering schools, and might be selected from practical masons if such were available, about which he had grave doubts. In the United Provinces there were certain classes of *mistris* who had been doing this kind of work for generations, and it might be possible to find such men there. Otherwise, the works-agents would have to be recruited from whatever class might be available, and specially trained. They would also have to be given a certain amount of general education as unless they could record measurements it would be difficult for the supervisor or sub-divisional officer to check their work. The number of works-agents and surveyors and estimators would depend on local circumstances in each province, but in the Central Provinces the number required of each class would probably be equal. In regard to the objection that the *mistris* who became works-agents would, owing to defective education, be much more prone to corruption than the present lower subordinates, he thought that there would not be much difference in that respect. His experience had been rather the contrary, and he had known some very honest *mistris*.

1314. He suggested that the prospects and position of the upper subordinates should be improved. Their pay was adequate, but they were treated as subordinates, and he suggested that the higher grades should be classed as officers. It was more a question of status than of pay that he was aiming at.

1,315. It was his firm opinion that, so far as economy was concerned, the actual cost of construction by the Public Works Department was as economical as it was possible to be. This opinion was based on the result of a special inquiry held in 1911-12, and a comparison he had then made of the rates of the Public Works Department and those paid by private persons.

1,316. He was entirely opposed to the suggestion that the maintenance and repair of considerable lengths of road might be handed over to a single contractor, as it would be impossible for any contractor to keep a road in order for a certain fixed sum. This sum had to be constantly changed according to the needs of the particular road, and the Superintending Engineer had power to vary the cost of maintenance on different roads in the same district, but if he found that one district was costing more than another he had to obtain the sanction of the Chief Engineer. It would be impossible to tell, beforehand, what the actual cost of maintenance would be. The rains or a *nullah* crossing might spoil a road, and thus the annual estimates would never be absolutely accurate. A good deal of work must, he thought, be done departmentally. As a rule consolidation was done by contract, materials and a steam roller were supplied and the contractor paid at a rate of Rs. 2 or 3 per hundred cubic feet. In regard to the suggestion that a length of say twenty or twenty-five miles might be given to one contractor for a period of years, he explained that, at present, the estimate had to be very carefully prepared before it was sanctioned for the next year, and that the contractor would have to do the same, but would not have the same knowledge as the Executive Engineer. Numerous contingencies, such as floods or the failure of a quarry, might occur, and these rendered it impossible to prepare an accurate estimate.

1,317. He did not agree with the view that the Public Works Department specifications for buildings were unnecessarily high, and considered that the Department was using as cheap materials as were practicable. Plans for

school buildings, police buildings and quarters for police constables were simple enough. He instanced a case where a department modified the Public Works Department standard plans, with the result that the building collapsed shortly afterwards.

1,318. The witness had drawn up the local fund engineering scheme for three divisions. He did not think that the experiment had been successful, firstly, because the area of the charge was too extensive, and, secondly, because the right stamp of man was not forthcoming for the post of district engineer; the latter defect being due to the fact that the pay was not sufficiently attractive. There was also multiplicity of control, and these engineers had to work under officers who knew nothing about technical matters, and hence they could not get things done as they wanted. To sum up, the service was unattractive, the area was too large, and the pay was too small.

1,319. He considered that all arterial roads and main lines of communication, and all buildings at headquarters, should remain with the Public Works Department, since local fund officers could not look after such works satisfactorily. As a matter of principle all works that were of provincial concern should be in charge of the provincial staff, and those that were of local concern in charge of the local fund. He did not think that this would lead to duplication of staff.

1,320. He did not like the suggestion that there should be only one agency for all the public works in a district, and considered that there should be two. He did not think that district councils could be expected to do provincial work, and was of opinion that if there were to be one agency it should be the Public Works Department. In the existing circumstances, however, although a single agency might be more efficient, he was not in favour of abolishing the local fund staffs, merely desiring that they should be improved. He was of opinion that the Public Works Department agency should continue to be maintained, as the interests of a district officer were naturally restricted to a certain limited area, whereas the Public Works Department had the interests of the whole province in view, and escaped from the grave into which a district officer was bound to fall. This difficulty would partly be removed by the appointment of a divisional engineer in charge of each division with the district engineers subordinate to him, but this system would merely be the same as the existing Public Works Department under a different name. The engineering establishment should, he thought, be under government, and not under the district councils, as the interests of government and the local fund could not be expected to be always identical. If there were a divisional engineer at the top under the control of the Chief Engineer, to safeguard the interests of government and with powers to issue orders and instructions to the district engineers, the system would be practically the same as that of the Public Works Department, but he considered that it would be impossible for one man to do both government and local works on account of their scattered nature. Two men would, therefore, be required in each district, and the subordinate staff would also have to be increased. It would come to the same thing whether the resulting department were called imperial, provincial or local fund, and there would be no improvement over the existing system, while the difficulty of famine work would be greatly increased.

1,321. He was of opinion that district councils were not sufficiently advanced to justify government in handing over all the main roads and buildings to them. They took no interest in the work and would be unable to control the staff, even if there were a divisional inspector of works. If the district engineer were a good man he would find it difficult to work in harmony with members of the district councils, who had not sufficient knowledge to enable them to administer a department properly. He did not think it would be advisable to attempt to develop their powers of administration in this way.

1,322. If instead of direct council administration a "Board of Works" were constituted, under the control of the Deputy Commissioner, containing representatives

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of the district councils and municipalities in the district, he doubted whether it would be possible for the Deputy Commissioner to exercise any real control; if, however, such a board were constituted, it should contain one or two engineers.

1,323. He was in favour of more decentralization in the Department, and suggested that the powers of Executive Engineers should be increased to about the limit at present exercised by Superintending Engineers. He favoured an increase in the powers of sub-divisional officers only in the case of those who were in charge of districts, but not in the case of those who were only in charge of sub-divisions. In the latter cases the sub-divisions were often very small, and the sub-divisional officers might not be men of the right stamp. In regard to the purchase of tools and plant, the sanction of the Chief Engineer was almost invariably required, and the Executive Engineer's powers of sanction were much too restricted.

1,324. Practically all the disciplinary powers over establishment rested with the Chief Engineer. The witness recommended that the Executive Engineer should have the power of dismissing lower subordinates, provided the former exercised the functions he had suggested for him, namely, practically those of a Superintending Engineer. If that recommendation were accepted, the Executive Engineer might have the powers over establishment, at present vested in Superintending Engineers.

1,325. The accounts work of the Executive Engineer was very heavy, and he had not sufficient time to devote himself properly to both the executive and accounts work. The witness considered that there was room for considerable simplification in the accounts, but did not agree with the suggestion that the Executive Engineer should be relieved entirely from all responsibility for them, and that they should be compiled in a separate central office, the Executive Engineer being required to submit only his cash book vouchers, and any other necessary forms. He considered that the Executive Engineer, as the man actually concerned with the accounts, should do the work and be the responsible officer. Just as the Government of India could not be expected to do the provincial accounts, so the Superintending Engineer could not with propriety do the Executive Engineer's accounts. If such a suggestion were given effect to the control of the Executive Engineer would be lessened. He did not think that the system followed in business concerns was very different from the present Public Works Department procedure, as in the Department there was practically a separate branch under the accountant, which kept the accounts, and was responsible to the Executive Engineer. He was not in favour of making the accountant independent, considering it essential for the Executive Engineer to have full control over his accountant and full responsibility for the accounts.

1,326. He admitted he had not worked out in detail the cost of the scheme outlined in his memorandum for the reorganization of the Department, but believed that it would not be unfavourable. Under his scheme there would be, in the Central Provinces, one Chief Engineer and five Executive Engineers, the latter exercising the same powers as the present Superintending Engineers. The Executive Engineers would have larger powers and larger pay, and might rise to Rs. 1,500. The Chief Engineer, and the two Superintending Engineers, as at present constituted, were more than were necessary for the work they were required to do. The witness had had enough work as Superintending Engineer, but this was mainly due to insufficient decentralization and to the fact that the powers of Executive Engineers were too restricted. He considered that Executive Engineers were fully competent to exercise all the powers now exercised by Superintending Engineers, and admitted that viewed in that light the pay of the Superintending Engineers was at present excessive. If his scheme were adopted, and the works establishment organized on a proper footing, it would result in great economy and increased efficiency.

1,327. He was of opinion that the post of Sanitary Engineer should be abolished, and did not agree with the view which had been expressed before the Committee

that there was too little rather than too much specialization in the Department. Executive Engineers could be found capable of preparing big water-works and drainage schemes, while, if there was any special sanitary schemes which could not safely be entrusted to those officers, an expert could be employed for the particular work. There were firms of sanitary engineers in India who could supply the necessary expert agency, or in case of necessity, a specialist from outside might be employed. He did not consider that at the present stage of development there were sufficient large schemes to justify the appointment of a Sanitary Engineer, and advocated entrusting the work to ordinary engineers. He held the same views in regard to the employment of Architects.

1,328. He suggested that the Indian recruits for the imperial service of the Public Works Department should receive practical training in England so that they might be brought into close touch with the actual construction and management of works as practised there. For example, if a man went to England he could visit water-supply and drainage works, and thus gain experience which would prove useful on his return to India. He did not mean to suggest that there was not sufficient field for training in India, but thought that practical training in England should be considered as a necessary part of the education of an engineer, just as in England visits to the Continent were considered a necessary part of a gentleman's education. An engineer should go to England, see exactly what was happening there, and bring back new ideas. This sort of training would be very useful to imperial engineers. In regard to the suggestion that instead of engineers receiving practical training on leaving college they should put in a certain number of years' service and then proceed on study leave to England, he stated that, as the imperial service would be composed of two kinds of men—those recruited from England and those recruited from India, the rules for both of them should be the same. At present both of them received their training in India. It would be an improvement, he thought, if a recruit from England had his practical training in that country before coming out to India and then had his Indian training in this country and, similarly, if an Indian recruit had training in India first and then were sent to England for practical training there.

1,329. He suggested that in giving contracts the India Office should impose a condition that the contracting firms should undertake to give practical training to a certain number of students. He admitted that the object of government was to get work done as cheaply as possible but was not prepared to believe, unless the experiment were given a trial, that firms would refuse to tender if the condition suggested were inserted in the agreement. Similarly, in India, it should be laid down as a strict rule that no firm should be brought on to schedule A (list of firms approved by the Government of India) unless the firm gave an undertaking that it would give practical training to a specified number of young men who desired to have it. He considered that the imposition of this condition would not in any way affect rates, nor cause the firms to increase their tenders.

1,330. He considered that all students who passed out of the Indian engineering colleges should have some practical training, and suggested that the Public Works Department might take a certain number of them on payment of a premium, the premium being either paid to the Executive Engineer or credited to government as in the case of fees to government servants when attending courts as witnesses. He admitted that Executive Engineers were already over worked, but contended that, if the scheme he had suggested were adopted, works would be better regulated and the Executive Engineers correspondingly relieved. With reference to the objection that Indian students were, as a rule, too poor to pay any premium, and that no students would take practical training unless they were paid a living wage during their time of apprenticeship, he suggested that, as an initial step and until the system of practical training was established in due course on a stable and satisfactory footing, government might encourage students by granting a

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number of scholarships in each province tenable for two years. The selection would have to be made by the local Governments from among deserving candidates who, while possibly very good engineers, might be unable to pay for their training. He could not say how much expenditure would be involved, as he had not gone into the details of the scheme, but he thought a living wage of Rs. 100 for Assistant Engineers and Rs. 50 for upper subordinates would suffice during the period of their practical training.

1,331. (*Mr. Cobb.*)—He was of opinion that the engineering colleges met the needs of India at the present time. He did not agree with the view that a large number of the students coming out of the colleges were of such a type as would never make really good engineers, but believed that the right stamp of man was being turned out. He considered that government should take steps to find employment for all these students, and, if government could not do so, the colleges might as well be abolished. Government could find employment in two ways. First of all, if government offered all the provincial engineer appointments, and also $\frac{1}{3}$ of the appointments in the imperial service, to Indian candidates, employment would at once be found for a large number of such engineers, and, further, if government showed the way engineering firms would follow suit. A little persuasion would however be necessary in their case, as they did not at present give encouragement to Indian students. In other words, government should at first find employment for all the students who passed out of the Indian colleges until this was no longer necessary owing to engineering firms coming forward to utilize some of the supply. If government treated their own students well, private engineering firms would probably do the same.

1,332. The lower subordinate class should be recruited as far as possible from the old *mistri* class, inquiries being made from Public Works Department officers as to where they could be found. There was a class of *mistris* in Agra and Gwalior, some of whom were very good, and from whom the witness himself even had been able to learn.

1,333. He did not accept the general proposition, except as regards *mistris*, that particular classes of persons who had naturally a practical trend of mind should be obtained. He was emphatically of opinion that the men trained in the Poona and other colleges had sufficient practical knowledge, and could handle machines if occasion arose. The fact was that they were not allowed to do so. He was unwilling to discuss the matter further, as it involved racial questions, but while admitting that there were certain persons who would not do manual work, he asserted that the majority would be quite willing to take off their coats and do any sort of work required, if they were given the opportunity.

1,334. With reference to the remark in his written statement that there must be no promotion from class to class, and that, in order to further the cause of economy and to repress all feelings of jealousy and discontent, nothing was more essential than to render the classification absolutely rigid and inflexible, he stated that anybody who knew the details of the constitution of the various services and was cognizant of the jobbery and favouritism that went on in many departments would understand what he meant. It was not possible for a man at the bottom to rise up to the highest position in the Department, and he could not contemplate a *mistri* rising to be a Superintending Engineer.

1,335. He did not think that at present the members of district boards were sufficiently capable to have their powers extended. To exercise the higher functions the gentlemen concerned would have to be more independent and more wealthy than they were at present. When a man was always thinking of his own bread and of his family no one could expect him to do much for the public good. When the proportion of wealthy men in India increased, men would be found to take an interest in public affairs, and then would be the time to expand their powers. The incapacity of the district council members was not due so much to want of public spirit as to want of public funds. He did not think that an Executive

Engineer would get on with the members of these local boards, who were generally lawyers, and often pleaders earning Rs. 50 or Rs. 100 a month, with large families dependent upon them, and hence absorbed in personal affairs and with no time to devote to public duties or to visiting works.

1,336. He had proposed that the Chief Engineer should be placed in the Secretariat, as that officer would otherwise have very little to do.

1,337. (*Rai Bahadur Ganga Ram.*)—When stating that government should find employment for students educated in the engineering colleges, he meant genuine employment such as would promote the energies and further the general training of the students.

1,338. He had expressed the opinion that *mistris*, as a class, had too much practical training, and lower subordinates too little. He wanted the lower subordinate class to be divided into two branches, one an executive branch which would be responsible for supervision and construction, and the other a project branch which would prepare plans and estimates, lay out roads, etc. He did not think that the present *mistris* had been found wanting, but there was too much over-crowding of duties, over-education and over-efficiency, and that was why he proposed two separate branches for the two different kinds of work. The boys of the craftsman class at Nagpur would not, he thought, be able to replace the lower subordinates, even if they were given a little more English education and a little more knowledge of drawing and estimating. In the Central Provinces there were always surveys going on, and ample work could be found for the two classes of *mistris* he had proposed.

1,339. He did not think that the standard plans in the Central Provinces were in any way expensive, and considered that they were as economical as any that could be made.

1,340. It was the practice, when there was a building to be constructed in an out-of-the-way place, which lay near the headquarters of a sub-divisional officer of the Irrigation Department, for the latter to undertake the work on behalf of the Buildings and Roads Branch or *vice versa*, debit being raised for the cost of establishment.

1,341. He was of opinion that the Director-General of Stores should be abolished altogether and that purchases should be made on strictly commercial lines.

1,342. He preferred that the provincial service should be pensionable, considering that all superior services should, as far as possible, be modelled on the same lines. He insisted that there should be uniformity, and would agree to the substitution of a provident fund for the provincial service only if the other services were similarly treated. It would not do to make the provincial service non-pensionable while the other services were pensionable. He would express no opinion on the suggestion that an advantage of the provident fund would be that a man could leave the service at any time and start in private practice.

1,343. In making the statement in his written memorandum that all the important sanitary works in the Central Provinces had been designed by members of the Public Works Department, he admitted that he did not know that the very first water-works scheme was designed fifty years ago by Mr. Binnie whose services were specially entertained for that purpose.

1,344. He was not in favour of relaxing the existing rules so as to allow government engineers to undertake private practice, and considered that such practice should only be allowed with the permission of the head of the department. He did not consider there was any analogy between the Public Works Department and the Medical Department as there was only one Civil Surgeon in a district and, generally speaking, he was not over-worked. In addition there was the consideration that the Civil Surgeon was the only medical officer available for the public, and government could not well debar them from consulting him.

1,345. He did not know of any retired engineers who would be willing to take up work as contractors. Personally, he would not do so.

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1,346. He saw no harm in giving out contracts for the collection of road metal for a term of five years.

1347. (*Mr. Mackenzie.*)—The engineers and upper subordinates turned out of the colleges belonged to the same stratum of society, and were very often brothers. It was not his intention to bar upper subordinates from being promoted to the Assistant Engineer grade, his proposal being merely that the present grade of sub-engineers should be entirely abolished and merged into the class of Extra Assistant Engineers. With reference to his remark that the distinction between the classes should be inflexibly preserved, he pointed out that there would be no necessity to promote from class to class if the Department were constituted on the lines suggested by him. His intention was that the training of each class should be so regulated and the scale of the staff so arranged that there should be no necessity for promotion from class to class. For instance a *mistri* should not become an Extra Assistant Engineer, and an Extra Assistant Engineer should not become a Chief Engineer. No subordinate should aspire to become an officer, and no provincial officer should aspire to be an imperial engineer. This would avoid favouritism. The training of the different classes would be entirely different, as it was now in the case of provincial and imperial engineers.

1,348. In regard to recruitment he thought that, if

government recruited the majority of their officers from the Indian colleges and if it exercised some persuasion, private firms would follow its example. As to whether these firms did not know their own interests best, he replied that a discussion of the point would involve a racial question which he was anxious to avoid, but he pointed out that in practice European firms did not generally take Indian engineers. Even if these firms did not follow the example set by government, government would have done its duty by showing the way and by exercising a certain amount of moral influence. With the spread of education, and under the influence of the government example, the tendency not to take Indians would gradually diminish.

1,349. (*Sir Noel Kershaw.*)—He did not consider that there was any necessity to have a "Board of Works" consisting of representatives of municipalities and district councils, under the Deputy Commissioner. If, however, there was to be such a body, he considered that there should be a technical engineer on the board, who would have to be superior in qualifications to the divisional engineer and be able to control the latter and to say where he was wrong. If it was not considered necessary to have a technical adviser on the board the necessity for the board was not, in his opinion, established.

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MR. F. A. A. COWLEY.

At Calcutta, Wednesday, 31st January 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

C. S. COBB, Esq., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

The Hon'ble Mr. H. H. GREEN, Chief Engineer and Secretary to the Government of Bengal, Buildings and Roads Branch.

D. G. HARRIS, Esq. (*Secretary*).

F. A. A. COWLEY, Esq., Chief Engineer and Secretary to the Government of Bengal in the Marine and Irrigation Branches.

Written Statement.

1,350. The subject matter of paragraph 1 of the Government of India resolution may be conveniently divided for purposes of discussion into two sub-heads.

(i). The substitution of private for departmental agency and the greater economy to be thereby secured, if possible.

(ii). The entrusting to local bodies the execution of government works, either through the agency of their own staff, or through private agencies.

1,351. With regard to the substitution of private for departmental agency I have to offer the following remarks :—

(i). This subject in Bengal requires examination from two points of view—locality and nature of works. There are also two classes of works—original works and repair works—and the considerations of locality are as between the presidency town of Calcutta and the *mofussil* generally.

(ii). It is also necessary to consider the character and efficiency of the private agencies through which work can be carried out which are at the disposal of government. There are European firms of recognised ability and integrity; there are smaller European firms of whom I have very little knowledge, there are Indian firms of standing and recognised ability, and there are many hundreds of petty contractors.

1,352. The proposals which I am called upon to discuss have reference to all these classes of engineering firms, and I am asked to say if private enterprise cannot be further encouraged by the construction through these agencies of much of the work now carried out through the agency of the Public Works Department.

(i). I may first of all say that tenders are publicly called for for all works; it is open to any contractor whatsoever to tender for the execution of any work. Works, except minor repairs, are so rarely carried out by daily labour that it may be said that all works are carried out under the contract system in some shape or form, and private agencies are encouraged to tender for the execution of these works. I understand that European firms in Calcutta do not tender for execution of public works for two reasons, the first being that the supply of steel-work, brick, *soorki*, lime, doors and windows, is usually made from the Public Works stores or through the agency of selected artificers, the second being their objection to the supervision of their work by Public Works Department subordinates. With reference to the first of these objections, it is natural that both European and Indian firms should prefer that the supply may remain in their own hands, as they would thereby reap a profit on the supply which now goes to the supplier. With reference to the second of these objections, I can partly understand it; the Public Works specifications are minute and rigorous and the supervising subordinates have

strict orders not to accept any work not carried out to specification. One of the arguments brought forward against the Public Works Department efficiency is the necessity which Public Works officers have found essential for the employment of a large subordinate establishment to exert a close supervision to ensure work being carried out correctly, to minimise waste and to control outlay. I have before me no proof that such is the case. What Public Works officers have found necessary it is my belief has also been found necessary by European firms in Calcutta. The difference between the subordinate supervision on public works executed by the Public Works Department and the works executed through private agency for the general public is, I believe, very small.

(ii). For the execution by contract of large original works in the town of Calcutta there is, so far as I am able to judge, no very keen competition as is evidenced by the fact that tenders were invited from five firms only, two European and three Indian, for the construction by contract of a large building estimated to cost about 6 lakhs of rupees. Upon this fact I lay a certain amount of emphasis, as it clearly shows to what extent the general public have confidence in the building firms established in Calcutta. It is my belief that the standard of work maintained by the Public Works Department in the execution of public buildings has a very beneficial effect in maintaining the standard of work in Calcutta. It is also my belief that the rates for building works in Calcutta are controlled more or less by the Public Works Department rates, and that the abolition of the present system of carrying out works in Calcutta under which the Public Works Department has its own brickfield, whence a constant supply of bricks can be had, under which tenders are invited from various firms for lime and other materials and under which the steel-work is imported direct from Europe, would lead in a few years to the general rise in rates.

1,353. For the execution by contract of large original works in the town of Calcutta, I would not hesitate to employ any one of a number of selected private agencies under what I would term the superior supervision, *i.e.*, by the Executive Engineer, the Superintending Engineer and the Consulting Architect to Government, and in point of fact this procedure has been employed in the past with the view to ascertain if Public Works rates are unduly inflated or not. Presumably, if this system was introduced on a large scale, it would be necessary in the interests of government to employ subordinates for the purpose of checking and measuring the work done as well as the necessary superior supervising establishment. On the subject of supervision I have to remark as follows :—

I have seen numbers of buildings which have been erected in Calcutta by local firms, and in one or two instances I have watched the construction of such build-

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ings and seen the quality of the supervision exercised. In one case I have in mind (a very large building indeed), the supervision was in my opinion inadequate, and certainly less than that given by an efficient Executive Engineer to any original work of the same magnitude in progress in his division. In addition to the Executive Engineer's supervision the Superintending Engineer of the Presidency Circle frequently and very thoroughly inspects original works in progress; the Consulting Architect to Government is another officer who frequently inspects works in progress, and is of the greatest assistance to the engineers who are entrusted with the work of carrying out his designs. I am strongly of opinion, until convinced to the contrary, that the superior supervision through the Public Works agency is much closer and better than the supervision ordinarily given to works in progress through private agencies.

1,354. With regard to the subordinate supervision, the quality of the supervision in the Public Works Department and that of firms of recognised standing and repute in Calcutta is much on a par, the same class of supervising establishment is used and it is my belief that the cost of such is not very different.

1,355. It is in the details of supervision of buildings of importance that Assistant Engineers, and both upper and lower subordinates of the Public Works Department, are trained and where they become acquainted with the possibilities of the actual work of the Indian artificer of all kinds. It is here that the European Assistant Engineer learns to understand the Indian workman, his good points and his bad ones, and not only workmen but his subordinates whom he will have one day to control. Do away with this school of practical training, and a severe blow is aimed at the whole structure of training in the Buildings Branch of the Public Works Department.

1,356. With regard to Indian firms in the presidency town of Calcutta, it is largely in the matter of supervision charges that they have the advantage over European contractors. The supervision is, as a rule, carried out by the contractor himself with the aid of an Indian engineer and a small staff of artificers; the cost of supervision to the contractor is consequently very small as compared with the same cost to the Public Works Department or to the European contractor. Indian contractors can therefore as a rule tender at the lowest rates. The conclusion I draw from these considerations is that it is possible to substitute the employment of private agency for departmental for the construction of all classes of original works in Calcutta, but to what extent any economy can be effected is to my mind very doubtful. There will be a small decrease in the cost of the building, there will be a small decrease in the cost of government supervision and in my opinion no more, but it is I think, an experiment which would require to be introduced with the greatest of caution. Do away with the Public Works system of work, I believe rates will rise, I believe the quality of work will deteriorate, mistakes will be of more frequent occurrence and last of all the best training school in Calcutta in the art of building will no longer exist.

1,357. In the foregoing paragraphs I have discussed the construction of large buildings only. It is, however, not only large buildings, but small buildings and small additions to existing buildings that the Public Works Department have to deal with. These works, as a rule, are dotted about over a large area; they cost comparatively small sums, and their carrying out involves proportionately greater expense to the contractor, inasmuch as the quantity of the work to be done is small. There is considerable competition already under the existing system between Indian contractors for such works, and it is in such works that the large majority of Indian contractors are employed. To hand over to private agencies the construction of such works, rather than through the agency of Public Works Department, will not in my opinion effect any large economies. If economies were possible, the possibility would, I believe, be apparent from the rates given in the tenders ordinarily received for such works, inasmuch as the competition

amongst contractors for such works is great; on the other hand, small works of this nature are not attractive to European contractors. In this question of additions or alterations to existing buildings is involved another question, i.e., the preparation of the plans and estimates for the cost of such works. It is in this respect more particularly that the Public Works Department meets the needs of other departments of the administration. Additions and alterations necessitate a considerable amount of consultation and co-operation between the officers who are entrusted with the work of carrying them out, and the officers of other departments interested in the additions or alterations.

1,358. I now turn to the question of original works in the *mofussil*. It is a very difficult one to discuss, inasmuch as it may generally be stated that firms of recognised standing and ability never tender for the execution of such works, although they might do so if they wish to. The general conditions in the *mofussil*, apart from the towns of Dacca and Darjeeling, are such as are not attractive to firms in Calcutta. The number of engineering firms existing outside the town of Calcutta is, so far as I know, very small, and their operations where such do exist are very limited in extent. I do not believe that any economies can be effected by the execution of these works by private agencies. European firms, so far as I know, are not attracted by such works, and the Indian contractor is, as a rule, unwilling to engage in a venture where conditions are difficult and financial losses are possible. It is my opinion that the best system of the execution of original works in the *mofussil* is through the agency of the Public Works Department, both as regards quality of work and economy in working.

1,359. I now turn to the subject of repair works in the presidency town. I have not had the time to gather figures showing the numbers of buildings, or the value of the repair works to be done in any one division in any financial year. I may briefly say that the number of buildings is very large and that the buildings are spread over a large area, that repairs are usually limited, except once in four years, to the pettiest class of work and the expenditure on the same is comparatively very small. It is further essential, inasmuch as the repairs are not executed at one and the same time, that a very rigorous and detailed system of accounts shall be maintained to enable repair estimates to be prepared, or the annual expenditure correctly arrived at. There are further many details which require a reference to the officer occupying the building, and these and other details can only in my opinion be carried out through the agency which has been trained to do the work. Consequently it is my opinion that unless the whole system of Public Works accounts is revised and the necessity for maintaining a record of repairs to works done and repairs executed to each and every building done away with, the execution of repairs through private agencies will neither prove successful nor economical. Further, by carrying out such works through private agencies, a very large number of small contractors will find their occupation in life closed to them. I have in my mind a case which has recently come to my personal knowledge the building to be repaired was a very large one and tenders were called for the execution of what in the Public Works Department is called quadrennial repairs. The total value of the work to be done was not a small one, on the other hand it was not very large. To my knowledge one European contractor tendered to carry out the work (this contractor originally built the building), the other tenderers were, I believe, all Indians, the lowest tenderer was a small Indian contractor and the work was entrusted to him. The work was executed under my very eyes, and as I saw a large amount of the work done I can personally vouch for the fact that the ordinary specifications insisted upon in the execution of such works were totally ignored. Is it any wonder that the accepted tenders were below those of the European firm which submitted tenders, and below Public Works rates? This is what, I believe, would frequently occur were the execution of repairs to government buildings handed over to private agencies.

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1,360. Regarding repairs in the *mofussil*, it is my opinion that any attempt to carry them out through private agencies, rather than through the agency of the Public Works Department, will prove a failure. The arguments I have put forward in the previous paragraph of this memorandum refer in a greater degree, and with greater emphasis, to repair works in the *mofussil* than to similar works in the presidency town of Calcutta.

1,361. It is in the *mofussil* that the Public Works Department so completely fulfils the requirements for which it was devised. It is well known to government how frequently officers of other administrations ask that buildings which have been erected for them, either through private or departmental agencies, may be taken over and maintained by the Public Works Department. The Public Works Department have of late been frequently required to report upon buildings which have been erected for the purposes of education from grants given by government. These buildings have mostly been erected through private agencies. It would be interesting to know in how many cases such reports have shown either satisfactory progress once the building has been started or efficient work.

1,362. To summarize my conclusions on the question of the transfer of the work now done through the agency of the Public Works Department to private agencies I am of opinion—

(i). That it is possible to carry out the proposals in Calcutta, to a limited extent, that any great economy will be derived thereby is doubtful, that there is not very keen competition in Calcutta among building firms, that by abolishing the system of execution of work through the agency of the Public Works Department there is a possibility of rates rising very considerably, and that there will be an enormous loss to government in the fact that the best training school for buildings in Calcutta will no longer exist.

(ii). As regards the *mofussil*, I am of opinion that, perhaps outside the large towns of Dacca and Darjeeling, it will be neither advantageous nor advisable to introduce such a system.

1,363. The next point I propose to consider is the entrusting of government work to local bodies for execution, either through the agency of their own staff or by private agencies. I understand this point to have reference only to the *mofussil* as apart from Calcutta. This idea is not a new one; not only is it not new, but it was largely given effect to by the local Government some years ago (I have not had the time to look up these papers) and was found to be a total failure. That such a proposal if given effect to would stimulate the growth of firms of standing in the building and allied trades in the *mofussil*, I do not believe. If such stimulus is wanting at present, why is it that, so far as I am aware, there was no growth in that direction evidenced at the time the district board carried out government works?

1,364. The next point I propose to touch upon is the demand for more highly trained engineers that would grow up if the work now done by the Public Works Department was entrusted to private agencies. As circumstances at present exist, I believe I am correct in stating that the supply of engineers from graduates of the Sibpur Civil Engineering College is greater than the demand. If the Public Works Department agency is abolished, and unless there is a considerable increase in the total amount of work to be done in Bengal, I cannot see how the demand for highly trained engineers is to increase. It is not in this direction that the demand lies. The demand is for skilled artificers and skilled artisans.

1,365. In paragraph 2 of the Government of India resolution the particular points which the Committee are to inquire into are enumerated. In the foregoing paragraphs I have discussed the question generally. I now propose to answer the questions alluded to *seriatim*.

(i). The system at present adopted for the execution of civil works both in Calcutta and in the *mofussil* is most suitable for the purpose for which it was devised, although economies might be effected by the employment of private agencies in Calcutta and in the big towns of Dacca and Darjeeling; it is not possible that such a system would prove either economical or suitable in the *mofussil*.

(ii). In so far as Indian private enterprise is concerned, I am of opinion that under the existing system it is fully encouraged. As regards European enterprise, I am not convinced that there is any necessity to further encourage the growth of European enterprise in this respect. The number of European agencies through which public works might be carried out is not great, and so far as I can see competition between such as do exist is not keen. As I have already stated, it is possible to entrust the construction of certain classes of public works to agencies other than departmental in the town of Calcutta, but I do not think that such a system would prove suitable for the maintenance of any class of building.

(iii). This question is outside my scope of reference.

(iv). So far as my own experience shows the answer is yes, differences of opinion do arise, but they are few and the matter at issue is usually settled satisfactorily by the Superintending Engineer. I know of very few instances where differences of opinion have been so great as to necessitate the orders of government. The relations between the various sub-divisions of the Public Works Department are, I believe, satisfactory.

(v). I do not consider it advisable to further decentralize in the Public Works Department itself; the powers financial, or otherwise, of officers of the Department have already been considerably increased, and I do not consider further increase at present desirable.

(vi). I do not consider that the Public Works Department Code is unduly restrictive.

(vii). I regret I am not sufficiently acquainted with the system of education in the government engineering colleges to be able to offer any opinion upon this question.

(viii). Whether the provision is adequate or not must depend very largely on the volume and nature of the original works in progress. In Bengal, generally, fairly adequate provision is made for practical training on building works.

1,366. Before closing my memorandum, I would draw attention to the fact that in addition to building construction many miscellaneous duties are entrusted to the officers of the Public Works Department, e.g., the maintenance and construction of roads, the manufacture of materials such as bricks and other miscellaneous works. With reference to road construction and maintenance, I am convinced that the Public Works Department agency cannot be bettered. I have had a certain amount of experience in the execution of such works through private agencies, and in the particular case which I now have in mind the system proved an absolute failure and the work had to be completed through the agency of the state. Not only were the specifications disregarded, and the work badly turned out, but excessive delays were of frequent occurrence, and eventually the work was completed at the contractor's request through agency of the state. Similar failures of the execution of engineering works are not unknown in Bengal. As an example of the varied nature of the work which has to be carried out through the agency of the Public Works Department I may quote one instance. The Mayo statue in Calcutta had to be turned round, this involved the lifting of the statue, a very heavy one, into mid-air and the reconstruction of the pedestal and re-setting of the statue. The work was carried out by departmental labour and executed, so far as I can remember without reference to the papers, at about half the cost tendered for carrying out the work through private agency.

MR. F. A. A. COWLEY called and examined.

1,367. (*President*.) The witness stated that he was the Chief Engineer for Irrigation in Bengal, and that he was

in his twenty-seventh year of service. His service had been fairly equally divided between the Buildings and

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Roads and Irrigation Branches, and a considerable period of it had been spent on foreign service, mainly in the former branch.

1,368. The Irrigation and Buildings and Roads Branches of the Public Works Department in Bengal were not entirely separated, and there were no distinct irrigation circles. Indeed there was practically no distinction in Bengal between the two branches, and each circle was entrusted with both irrigation and buildings and roads work. The Superintending and Executive Engineers attached to these circles and divisions, respectively, supervised both classes of work, but in some cases the Executive Engineer had very little irrigation work in his division. This arrangement was, in his opinion, a satisfactory one for Bengal, and he did not consider that it could be changed without a very large increase in establishment. It was not so much that the irrigation work in any one particular division was not of sufficient importance to justify a separate irrigation officer as that the separation of the two branches would entail large additions to the *personnel* of existing buildings and roads divisions, if the present work were to be carried out by a purely buildings and roads divisional staff. Irrigation work in Bengal was very scattered, and this might be the main reason for not having a separate Irrigation Branch.

1,369. Public Works Department officers in Bengal were borne on one list and posted to the divisions for which they were best suited. For instance, officers who had specialized in particular irrigation subjects were given the divisions which had the most irrigation work in them, and those who had only buildings and roads experience were not posted to these divisions.

1,370. The Sanitary Engineer to the Government of Bengal was not subordinate to the Chief Engineer though he ranked as a Superintending Engineer. The witness was not aware of the reasons for this arrangement. He considered, however, that it had proved satisfactory in Bengal, and he had had no cause to consider it otherwise. The post of Sanitary Engineer, Bengal, was not included in the regular cadre of the Public Works Department. It was a special post recruited for separately from England, by the Secretary of State.

1,371. Sanitary projects for drainage which tended to relieve malaria, etc., as distinct from agricultural drainage works, were largely dealt with by the Irrigation Department, and also projects for the proper and sufficient drainage of large areas surrounded by embankments and below the level of surrounding rivers. Municipal and all other town drainage schemes were more within the province of the Sanitary Engineer, who had hitherto, so far as he knew, had very little to do with projects for the drainage of large agricultural areas.

1,372. The local Consulting Architect's post was not included in the sanctioned cadre of the engineering branch of the Public Works Department, but it might be advantageous to bring it on to that of a special branch. It was a special appointment recruited for specially.

1,373. The local Consulting Architect had a very great deal to do with the construction of buildings. Though he was responsible only for designs and not for actual construction, he had proved to be of great assistance during construction, and visited buildings in an advisory, not in an executive, capacity to see whether they were being constructed according to his designs. The ordinary Public Works Department staff carried out the actual construction of buildings designed by that officer. His experience had been that this arrangement was eminently satisfactory. Provided the Architect possessed the necessary qualifications, he saw no objection to the proposal that such an officer should be made responsible also for the construction of buildings, and, in principle, he thought that the Bombay system, under which there was a separate buildings division in charge of the Architect, who was not only responsible for the plans of buildings but had also a separate construction staff of his own, would work well in Calcutta. Under existing circumstances this arrangement would, however, not be suited to Bengal, as the local Consulting Architect had already too much work to handle.

1,374. The three divisions in Calcutta were practically wholly buildings and roads divisions under the Superintending Engineer, Presidency Circle. Each of these divisions had a certain amount of road work, with the exception of the 2nd Calcutta Division, e.g., the *maidan* roads in Calcutta, a portion of the Grand Trunk Road and the Barrackpur and Diamond Harbour provincial roads.

1,375. The remaining specialized branches in Bengal were the Electrical Division and the Plumbing Division, both of which were under the Superintending Engineer, Presidency Circle. The work of the Electrical Branch was confined to Calcutta, and there was a separate establishment for electrical work outside. The witness was uncertain as to whether there was any government electrical plant in any station other than Calcutta, but he thought that there might be some in Dacca. Electrical plant outside Calcutta was in the charge of an Electric Inspector who had no connection with the Executive Engineer, Electrical Division.

1,376. The post of Superintendent of the Governor's Estates was an appointment originally held by a subordinate officer of the Public Works Department, and comprised the maintenance of the government houses at Calcutta and Barrackpur and the arboriculture in the grounds and parks. When he was Executive Engineer, 1st Calcutta Division, the Superintendent of the Governor's Estates was subordinate to the Executive Engineer of that division. He was not aware of the present position of the Superintendent, as he had been Chief Engineer for Irrigation for the past two and-a-half years, during which period the Superintendent had not been subject to his control.

1,377. From his experience of building work in Calcutta he knew of only two reliable firms of contractors, in that city, who were capable of undertaking their own work *ab initio* with their own staff. These were architectural firms, but had not the same status as similar firms in Bombay. Outside Calcutta there were no reliable firms of contractors or architects, not even in Dacca.

1,378. A system for the registration of contractors was in force in the presidency. Under this, each division registered its own contractors as 1st class, 2nd class, 3rd class, or petty contractors. The differentiation in this respect was based on the Executive Engineer's experience of the individual from year to year, and the classification was revised periodically.

1,379. Tenders were invited by the posting up of printed forms and the insertion of advertisements in the local newspapers. The printed forms were always available. Tenders for work were usually called for piece-meal, but there was no objection to a man tendering for an entire work. There were certain rules, however, under which the Department had to issue materials from its own stock, such as bricks and steel-work, the latter of which was usually obtained from the Director-General of Stores, and also other materials, such as lime, which was usually obtained from other contracting firms who specialized in lime. All these materials were handed over to the contractor selected for the work. The system of inviting tenders for portions of a work instead of a whole work was a long standing practice, and he understood it was necessitated, more or less, by the fact that government maintained its own brickfields, and thereby ensured the quality of the bricks required. This was of great importance as bricks were thus made available at any time and their rates very accurately known. Similarly, if for a particular class of work a particular class of lime from a particular firm was needed, this was bought by government and supplied to the contractor. In regard to steel-work, the orders of the Government of India were more or less to the effect that if requirements could be foreseen sufficiently early, steel-work was to be obtained through the Director-General of Stores, India Office. He was of opinion, however, provided the necessary supervision was exercised, that there was no objection, if specifications were drawn up detailing the quality of bricks, lime and other materials to be used, to tenders for whole building projects being invited. As an example, he cited the case of the Chaplain's residence

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attached to St. John's Church, for which the contract was given in a lump sum tender, but added that he believed this was done only with the object of finding out whether the Public Works Department rates were high or low, and how they stood in regard to the open market.

1,380. Government was obliged to have its own brickfield, and to make arrangements for the supply of bricks to contractors, as bricks were not always available in Calcutta. There were large private brickfields, but he had known times when good bricks were not procurable. He could not say whether, if government introduced a system of complete tenders for buildings, sufficient privately-made bricks would be available, as competition in Calcutta was in his opinion very poor. Of late years he had not compared the cost of materials manufactured by government with that of materials sold in the open market, but he believed bricks supplied from the government brickfield were, in normal times, cheaper than privately-made bricks.

1,381. When he was a Superintending Engineer he had made a comparison of the cost of government and private bricks. With regard to this comparison, he explained that government did not undertake the actual manufacture of bricks but leased its brickfield to a contractor who did the work under supervision, so that the cost of bricks was really the rate tendered by the contractor and not the actual cost of manufacture. Therefore, in making the comparison, he did not take into consideration the capital cost of the brickfield, nor any sinking-fund for the exhausted brickfield, as the brickfields were never exhausted being filled up by silt every year by means of water let in from the river Hooghly for this purpose. The cost of the establishment employed for the management of the government brickfield was in the contractor's hands, but government employed a supervisor on the work, the salary of whose post had not been taken into consideration when making the comparison referred to. In spite of the exclusion of these factors he still considered the Public Works Department bricks were cheaper than those obtained in the open market. For works in the *mofussil* bricks were not supplied from Calcutta but were manufactured locally. In such cases, the rate for bricks included an allowance for the capital cost of the brickfield.

1,382. Government also manufactured lime in the *mofussil*, but this depended upon the size of the work. For a small work costing say Rs. 150, for which lime could not be bought from a contractor, it was made on the spot, and even for large works it was sometimes necessary to burn lime at the site of the work, either departmentally or through the contractor.

1,383. The large building referred to in his written evidence, for which tenders were invited from five firms only, was not a building erected for government, nor for a private individual, but one required by a public body. He was of opinion that the system of substituting large private contractors for government agency might be feasible in Calcutta and possibly also in Dacca, but did not believe that it would be as economical as the present arrangement. Economy might be judged by two methods, either by the actual cost of the work or by the value of the complete building when constructed. The standard of Public Works buildings in Calcutta was very high. A well-known Chief Engineer, who was afterwards Secretary to the Government of India in the Public Works Department, once made this remark and, as a general rule, big buildings erected by the Public Works agency in Calcutta cost very little for maintenance. True economy had reference not so much to the initial cost of a structure as to its subsequent cost of maintenance. The result of a previous comparison made by him of the rates in Calcutta for the same class of work executed by the Public Works Department and by private agency respectively, was that the rates of the latter were certainly not lower. They were about the same. He instanced the case of a building erected by a large firm of contractors in Calcutta, who followed the Public Works Department practice of having the floors laid by a separate firm. The rate they paid for

this was the same as the Public Works Department paid. He had also had occasion to compare the Public Works Department rates with those of the Corporation of Calcutta, as the rates of this body came before him in evidence once or twice when he was a member of the Calcutta Improvement Trust Tribunal. He believed their rates to be very much the same as those of the Public Works Department. The Port Trust rates also were about the same. The Public Works Department rates were the criterion of rates in Calcutta, and, as he mentioned in his written evidence, they formed the basis on which other public bodies fixed their rates.

1,384. In making his comparisons of rates he had not taken into account the expenditure on establishment, as the Public Works Department did not regulate its establishment by reference to the units of work, e.g., by so many hundred cubic feet of brickwork, etc., though the cost of establishment was taken into consideration when a private person erected a building. He explained that, when arriving at the Public Works Department rates, the estimated cost of labour and materials was included and 12½ per cent. added to this, and that he had personally always followed this principle. The allowance of 12½ per cent., he thought, ought to cover not only the cost of the contractor's establishment, but his profit also.

1,385. Some saving in supervision might be effected if large firms of reliable contractors were employed, but this saving would be effected in subordinate supervision only. He drew this conclusion from the Government of India's resolution from which he understood it was the intention that government engineers should ultimately resemble the local county board inspectors in England. Subordinate supervision could not be entirely dispensed with, however, and a certain amount of it would still be necessary, even if large firms of contractors were employed and given the construction of complete projects.

1,386. He did not think the "Direction" charges in the Public Works Department were unduly heavy, and did not agree with the contention put forward in evidence that the fact that out of the total establishment charges about 25 per cent. was due to "Direction" indicated extravagance under this head. He did not consider it possible to extend a Superintending Engineer's charge as it was already very heavy. With regard to the contention that the employment of large contractors would effect savings in "Accounts," he remarked that this depended on what records it was still considered necessary to maintain.

1,387. He knew of no reliable firms of contractors outside Calcutta, but considered it feasible, when large works were to be constructed in the *mofussil*, for Calcutta firms to take them up. In fact such work was, at present, open to these firms as bricks were not supplied in the *mofussil* and lime also was only occasionally supplied. There was no need for any restrictions, in the *mofussil*, on the supply of materials from government sources, and beyond, possibly, a legacy of bricks remaining on stock there was no limitation in regard to the importing of material, except in regard to steel-work if the amount required was foreseen in time.

1,388. A separate estimate for the annual repairs to each building was prepared in Bengal, and the question whether this was necessary or not depended entirely on what records were to be kept. Under the accounts rules the Department was forced to keep certain records, as it was necessary to know what a building had cost in repairs over a series of years, and this necessitated the preparation of an estimate, for entry in the register of works where outlay was recorded by sub-heads. On his attention being drawn to the fact that in one province no estimate whatever was prepared but that a certain percentage was allotted each year for the repairs of each particular building and that the expenditure had to be kept within that annual allotment, he remarked that the suitability or otherwise of this arrangement depended very much on the cost of the work, as details of works costing less than a certain figure were not entered in the register of works, while if they cost above that

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sum they were entered in detail by sub-heads. For annual repairs to residential buildings it was necessary under Code rulings to keep a record of the actual cost of repairs every year, but for buildings, other than residential buildings, a lump sum might be allotted. Even though an account of the actual amount spent on repairs to buildings would still be required he thought it was necessary to prepare estimates, as the budget for repairs was based on lump sum estimates and the net total of these was the amount it was necessary to look to. In order to arrive at this amount a detailed estimate had to be made of what the actual cost was going to be, because when the Superintending Engineer made allotments from his grant for repairs to buildings, he probably found that in any one year one building required more than the sum which had been set aside for it and another required less. It was not possible to say exactly what a certain building was going to cost. For buildings that required only whitewashing and other petty repairs there were standard measurement books, and it was the practice only to refer to the quantities, etc., noted in such measurement books in preparing repair estimates. He was not prepared to give an opinion on the proposal that an Executive Engineer should be given an allotment for repairs for all the buildings in his charge, and allowed full discretion as to the manner in which he spent the money, *i.e.*, that that officer should prepare no estimates, but simply keep an account of expenditure, whatever the sum might be, on repairs to each individual building.

1,389. As instances where buildings were taken over by the Public Works Department after construction by private agency, he cited police buildings, such as a police *thana*, for the construction of which a grant was made to the Superintendent of Police and school buildings, for the construction of which the Director of Public Instruction was given a grant by government. The system of construction of buildings by the administrative departments concerned had been followed to a considerable extent in the past, in the belief that such buildings might be built cheaper by private agency. In his opinion it had proved a failure inasmuch as the officers who had charge of the buildings, and had had them erected through private agency, had subsequently come to see that they were not able to maintain them on the ordinary amounts which were set apart for maintenance, as the original construction was wholly bad. As a result of this they applied to have their buildings taken over and maintained by the Public Works Department.

1,390. He was not able to recall any instance of a building being handed over to an administrative department for maintenance after it had been constructed by the Public Works Department, and expressed himself as being almost positive that he had never had experience of such a case. The difficulties experienced in Bengal in getting administrative departments to undertake their own building work, or even annual repairs, were so very pronounced that he did not think it was feasible, in order to relieve Public Works officers of a large amount of petty repair work, to introduce a scheme under which this work would be transferred to the administrative departments concerned, such as the Education, Police, etc. He added that he thought such a question could more suitably be answered by officers of the departments concerned, but his own belief was that they would prefer the work to be done for them by the Public Works Department.

1,391. Very occasionally, he thought, the Public Works Department were asked to construct some particular building for a local body. The ordinary work which the district engineer had to carry out for the district board, to which that officer was the adviser, had nothing to do with the Public Works Department at all, but the Superintending Engineer of the circle concerned was sometimes asked to advise. He cited the case of a building in connection with the construction of which he was asked by the district board of Jessore to advise on the foundations. Plans and estimates, however, above a certain value which he did not remember, were always submitted by local boards to the Superintending Engineer for scrutiny. Such references were not made to the

Executive Engineer, but only to the Superintending Engineer. He was not aware of any charge made by the Public Works Department for this scrutiny, nor was he aware of any rule under which projects above a certain value were to be submitted, not merely for scrutiny, but also for the preparation of plans and estimates by the Public Works Department.

1,392. Each local body in Bengal maintained its own engineering staff for its own works. He had had experience of the system in force in the nineties, under which government transferred its buildings and roads to this district staff for maintenance. This system proved a failure in workmanship, supervision and the maintenance of records; the buildings were not properly maintained, and in the majority of cases more records were missing than available. He did not think all government buildings in the *mofussil* were at that time transferred to the local bodies, but the greater proportion of them were, even buildings at the headquarters of districts.

1,393. Roads in Bengal were mostly district board or local board roads. Some provincial roads were maintained by government through the agency of the Public Works Department and some through the agency of district boards. As an example of a road maintained by government through the agency of a district board he cited the Grand Trunk Road, which left Calcutta on the Howrah side of the river. The first portion of this road was under the 3rd Calcutta Division, the next portion was under the district engineer of Hooghly and the next portion was under the district engineer of Burdwan. Government had taken over a portion of this road for repairs through its own agency—the Public Works Department. Repairs to provincial roads were carried out by two agencies—government agency and district board agency. In both cases government gave the money, but in one case the work was done by the Public Works Department and in the other by the district board staff under the district engineer. Whenever government made over a provincial road for maintenance by a district board it provided the funds, and in addition to actual maintenance charges it gave the board 15 per cent. for establishment.

1,394. The principle underlying the division of roads in Bengal into provincial roads and district board roads was that roads which formed through means of communication were termed provincial roads and the rest district board roads. The provincial roads in Bengal had in the past formed the main avenues of communication and were still very important. He was not aware of the exact conditions attaching to this differentiation, and added that district boards occasionally asked government to take over a road as a provincial road. Provincial roads maintained by district board agency were very few in number and had never been numerous, not even during the nineties, as at that time there was not much road work. He believed the only provincial roads so maintained at present were the Grand Trunk Road, Diamond Harbour Road, Barrackpur Road and Jessore Road. He believed government did lay down conditions regarding control when it made over its buildings and a certain amount of its roads to district boards for maintenance and provided funds for that purpose, but he was not able to furnish these conditions.

1,395. In respect to decentralization, the Government of India had authorized powers of technical sanction to be delegated to Superintending Engineers in Bengal up to Rs. 50,000. This power had been fully delegated by the local Government, and all the Superintending Engineers with whom he had dealings exercised this power of technical sanction. An Executive Engineer's powers of technical sanction were limited to Rs. 2,500. Though he had stated in his written evidence that this power was sufficient for an Executive Engineer, he considered that selected Executive Engineers might be given greater powers. Sub-divisional officers in Bengal possessed no powers of technical sanction. If it was intended to give sub-divisional officers powers of technical sanction, he considered that no Assistant Engineer under seven years' service should be entitled to this concession, but

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added that he did not think such a further delegation of powers would be worth while.

1,396. Provided a right of appeal to the Superintending Engineer was allowed for, he was in favour of Executive Engineers being given certain disciplinary powers over their staff. He did not approve of a right of appeal to an authority higher than the Superintending Engineer, as was the case at present in the Public Works Department, and also in the Civil Department, where appeals were permissible to the Secretary to Government.

1,397. The whole of the rules regulating the local purchase of stores required complete revision from the beginning. He saw no reason why everything should be obtained from the Director General of Stores. There were eminent firms in England who had branches in Calcutta, and although these branches might quote even lower rates than the Director General of Stores could obtain for the supply of a certain article from England, it was not possible to purchase such an article locally. He advocated the abolition of the rules altogether and the abolition to a great extent of the Director General of Stores, as very little benefit was derived by buying an article through that officer especially when the difference of cost to government might be as little as 1½ annas per hundredweight, and involved the wastage of a lot of time and paper.

1,398. In regard to the system of audit in Bengal, he remarked that this question had been investigated very thoroughly some time ago and that he had written a memorandum on the subject. This memorandum, however, was written more especially with reference to the abolition of the public works Examiners of Accounts and the amalgamation of these accounts with the civil accounts. He had no recommendations to make in regard to the present system of accounts, as he had not considered the question, but in connection with the contention that this system was so complicated and that the compilation of accounts was so detailed that it interfered with the executive efficiency of the Department, he remarked that there must be a certain amount of detail involving complication in accounts in order to make an Executive Engineer thoroughly understand what was being done. No Executive Engineer could be said to be thoroughly conversant with all that was going on in the division, unless such an officer thoroughly examined the register of works. Such an examination, if carefully made, necessitated going thoroughly into the expenditure incurred month by month. One of the complaints of the Accountant-General of practically every province in India had reference to the extent of expenditure in the month of March which was said to be much too large. If this was to be overcome, the Executive Engineer ought to be thoroughly conversant with what was happening in December, February and so on, and in order to effect this it was necessary for him thoroughly to master the whole register of works. He would then have a thorough grasp of what every man in the division was doing in the way of working out his allotments by the end of March. If there was a simplified form of accounts which required only a signature at the bottom, he did not think it would have the desired effect. His opinion, therefore, was that the present system of accounts tended to efficiency, but he admitted that the requirements laid down for an Executive Engineer might be met by a simplified system if such could be evolved.

1,399. His experience of the class of student turned out by the Sibpur College was considerable. Provided an upper subordinate absorbed his training and made use of the knowledge he had gained, witness personally thought it was clearly proved that the college training given to this class was satisfactory, but added that there might be two men who had been through the same course at college, and joined work on the same day and at the same hour yet, though both were equally qualified when they started, one proved a success and the other did not. He was not able to express any views on the theoretical training given at the Sibpur College as he did not know the curriculum of instruction followed there, but as upper subordinates were frequently recruited from the ranks of the Calcutta University B.Es. which was a

higher standard of education than was necessary, he thought it was the general experience in Bengal that the standard of theoretical training given at Sibpur was too good, and produced an officer with a much larger knowledge of the theory of engineering than was required in the subordinate grades for the class of work such an individual did in the Department.

1,400. The class of lower subordinate recruited in Bengal, however, was not too highly trained, but he added that it was very difficult to answer any questions about the lower subordinates, because the efficiency of that class depended entirely upon the kind of work they had to do, and that this was more or less learnt by routine. A portion of the theoretical course given to that class might profitably be omitted and more practical subjects substituted. If a sufficient number of sons of craftsmen, such as artificers and skilled artisans were available, he favoured the proposal that a portion of the present lower subordinate establishment of the Public Works Department might be recruited from that class, but remarked that the only master craftsmen available in Bengal at present were Chinamen, who made the best master carpenters, and men who worked in wrought iron. For buildings and roads that class would, undoubtedly, make useful lower subordinates.

1,401. The Public Works Department in Bengal took in students from the Sibpur College for practical training, not only those who ultimately entered the Department, but also others. He was under the impression that two or three were taken in by the Department for training every year. The Superintending Engineer of the circle appointed the apprentice to a division and was at liberty to employ him on any work considered suitable, for instance the student might be given survey work, or be put on to learn how a building was erected, or to check the rates at which work was carried out. They were thus able to acquire knowledge of the cost of materials at first hand, the number of masons necessary for a particular work, the processes of mixing concrete, mortar, etc. They were required to take notes of what they had seen, and these notes were examined from time to time by the Executive Engineer and sub-divisional officer, who advised and taught the students generally. The period fixed for this training was about one year.

1,402. The Public Works Department did not pay the apprentices but he believed that these students received, from the college, scholarship allowances during this period of training. The system might be perfectly satisfactory, but that depended mainly on the student himself and to a certain extent on the Executive Engineer who undertook the training. An extension of this system in Bengal, so as to give training to a larger number of men at one time, depended on the quality and quantity of the work going on, which in normal times in the Buildings and Roads Branch was a fairly constant factor. He saw no reason, however, why facilities should not be given for the training of more students than at present in the art of building, and added that if any big irrigation schemes came up there would be an enormous field for students, and that there were several such schemes which the Department hoped to get started some day. Selection for government appointments was made after this period of practical training by means of a practical examination at which the final position of the men was decided. A Superintending Engineer was the president of the board of examiners, and one of the college professors and an Executive Engineer were members of the board, and the ultimate place of the candidate depended on a combination of the results of the practical examination and those of the B.E. examination. The age-limit up to which students were allowed to qualify for their degree was 24, this being fixed by the University rules. He considered that this system worked satisfactorily.

1,403. (Sir Noel Kershaw). The register of works tended to efficiency by drawing an Executive Engineer's attention to his position in respect to the outlay on each of his works. He was of opinion that this would not be the case if this register were not sent monthly to the Accountant-General. The result of an Executive Engineer omitting to look through and examine carefully the

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monthly forms which that officer had to submit would be that he would certainly get into trouble. He knew of an instance where an Executive Engineer had signed a certificate certifying that the accounts were correct, and, though they might, in that officer's opinion, have been absolutely correct, yet it did not strike him that on a certain work he ought to have spent Rs. 10,000 whereas he actually spent only Rs. 5,000. Witness, however, admitted that such a case was the exception rather than the rule. He was not aware of the fact that certain Executive Engineers had stated that they did not examine all the accounts they certified, and expressed surprise at hearing that this was put forward in evidence. Eight hours altogether was the time which he considered that an Executive Engineer should devote to a thorough check of the entries in the register of works, excluding the check of the day books and accompaniments thereto.

1,404. The experiment of the nineties previously referred to of handing over works to divisional local bodies lasted from 1892 to a little later than 1897. It was in 1897 that a committee appointed to report on the subject recommended that this system should be done away with. The bad maintenance of records and bad work performed when this system was in force was partly due to want of interest on the part of the district engineer and his staff. He was not able to suggest why there should have been this lack of interest on the part of the district engineer, but explained that as that officer was not a government servant, and was dependent solely on the district board for his appointment or dismissal, lack of interest in government works did not affect his position even though extra remuneration was given him by government for doing the government portion of the work. In other words, although this officer received extra remuneration for doing government work, he did not apparently see that his interest lay in continuing to do that work.

1,405. When a contractor undertook to do work for the Public Works Department lime was supplied by a particular firm. There was no objection to such a system so long as a single firm possessed the monopoly for a particular kind of lime, such as "ghooting" lime, which was used for foundations and which was supplied almost entirely by one firm. The particular firm was not specified to the contractor, but only the particular kind of lime.

1,406. The contractor who undertook to manufacture bricks for government acted as a lessee of government, and contracted to make the bricks within a specified period. The fact that government confined itself to taking bricks from one source did not tend to prevent firms from starting their own brickfields. Some private firms had very large brick works and were at liberty to extend their works. He had known occasions, however, when there had been a shortage of bricks, but could not say whether this was due to want of interest on the part of the firms.

1,407. In respect to the statement in his written memorandum that as tenders were invited from only five firms for a certain large building there was no very keen competition among contracting firms in Calcutta, he remarked that his impression was that the practice of calling for tenders in the open market, as was usually done in India, was the converse of that obtaining in other countries where tenders were usually restricted to four or five selected firms.

1,408. (*Mr. Mackenzie.*) His remark that government rates regulated market rates did not, he explained, mean that the latter were actually limited by the former, as government exercised no power whatever over the market rates.

1,409. In connection with the rules relating to the local purchase of stores he remarked that his experience was that officers who, after obtaining technical sanction to works, foresaw what they would require sufficiently early, indented for the articles on the Director General of Stores, India Office, but if they were pressed for time they purchased the articles locally. His impression was that the local purchase of stores in Calcutta had not decreased, but had, on the contrary, rather increased

in amount. Firms which supplied the Director General of Stores with materials and which had branches in India tendered at the same rates in Calcutta for the articles as they did in England. The only difficulty experienced by purchasing locally was the absence of the test made by the Director General of Stores, which was not available in India but, he added, if an article broke at the first, second, or even fifth time of usage, no firm of any standing in Calcutta would hesitate to replace it. Rule 8 of the Stores Rules did, he thought, tend to make officers write to England for materials instead of purchasing them locally as they interpreted the rule to lay down that if it was foreseen sufficiently early that an article was required it should be obtained by indent on the Director General of Stores, unless it was manufactured and could be bought in India.

1,410. Public Works Department bricks were cheaper than market bricks because an increased demand for market bricks sent up prices very largely, and if the demand was very great a manufacturer could ask what he liked; whereas the cost of government bricks, even if the cost of the brickfield were added, remained fairly constant. The cost of this brickfield, however, would amount to practically nothing as it had been in use for a long period of years—thirty or forty perhaps—and the number of bricks turned out was so enormous that the original cost, when added to the rate per thousand bricks, would make a very small difference.

1,411. Every Executive Engineer was troubled with the enormous number of objectionable items statements prepared by the Accounts Department. He, personally, had been inordinately troubled in this way. He referred to his remark in his written evidence where he had mentioned that when the Public Works system of accounts was done away with Executive Engineers felt they had lost a friend in the examiner of accounts. These Examiners used to visit the offices of Executive Engineers and explain what could or could not be done, whereas under the present system the Executive Engineer was very seldom present when the examination of his accounts was held. The Examiner of Accounts was not a peripatetic auditor, but carried out only an annual examination as was at present the system.

1,412. Under the existing rules he had no objection to the promotion of upper subordinates to officer grades, but remarked that it was not necessary on this account to improve the course of instruction given to this class of subordinate, as an upper subordinate was very rarely promoted to the rank of an Assistant Engineer until he had served a considerable number of years. Besides, such promotion did not pay this class of officer after the grade of sub-engineer second grade had been attained, although it paid a supervisor to be given the rank of an Assistant Engineer. The result of the present rules was that an upper subordinate, promoted to the rank of an Assistant Engineer, rarely reached the rank of Executive Engineer. Practical examinations in riding and surveying which were regulated by certain definite printed rules were necessary for this class of officer.

1,413. (*Rai Bahadur Ganga Ram.*) It would certainly tend towards improvement in the construction and supervision of works by local bodies if the engineering staffs of district boards were brought on to one cadre, not necessarily as a pensionable establishment, but under the orders of the Superintending Engineer, and not left entirely to the control of district boards. He was not, however, able to state whether the bad work of local bodies which he had experienced was due to members of those bodies interfering too much in the method of execution of works.

1,414. The reason why the government bricks made at government kilns were cheaper than market bricks might possibly be due to the fact that contractors added on to the rate for their bricks the interest on their capital outlay. The government capital outlay for this particular work was however not heavy, as no machinery was required.

1,415. No inconvenience arose from the fact that Superintending and Executive Engineers in Bengal did both irrigation and buildings and roads work, and yet

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were under a separate Chief Engineer for each of these two branches of the Department.

1,416. The Sanitary Engineer to the Government of Bengal was under the Sanitary Board and approached government through the Municipal and General Department of government, which had no connection with the Public Works Department. This officer did not accord technical sanction to sanitary projects. These projects were, he thought, sanctioned by the Sanitary Board, of which both the Chief Engineers were members.

1,417. He did not think the Consulting Architect to the Government of Bengal was invariably consulted, as was the case in Bombay, on original works in Bengal when they were only small buildings costing about Rs. 5,000.

1,418. As it was necessary to keep up the standard of materials, and also to have one officer responsible for them, he approved of the suggestion that the Director General of Store's office might be transferred to Bombay or Calcutta.

1,419. In analysing rates, 12½ per cent., which included contractor's profit and establishment, was allowed for. It would prove cheaper, by a small amount, if the rule regarding advances to contractors were relaxed to a certain extent subject to adequate safeguards and if Superintending Engineers were allowed to sanction advances to contractors.

1,420. District boards and municipalities were advised by the Public Works Department in regard to sketches and designs, but a regular system of giving designs to these bodies was not in force.

1,421. Standard plans in Bengal related chiefly to police buildings. There were not many standard plans for *dak* bungalows and *tahsils*. The number of such plans had now-a-days been much reduced. He had compared the standard plans adopted in Bengal with those of other provinces, and had found considerable similarity between them.

1,422. The lower subordinates employed in Bengal were recruited from Sibpur and Dacca, not from Roorkee. His experience was that, as a class, *mistris* were of more value than sub-oversers on building works. He did not desire to improve the character of the *mistri*, or that individual's knowledge of writing or arithmetic, and remarked that provided a *mistri* had the necessary practical knowledge, he was far more useful than anybody else. If *mistris* were sufficiently qualified, it might be desirable to create a regular establishment for them.

1,423. (*Mr. Cobb.*) Skilled artisans and artificers were not procurable in any large numbers in Bengal. It was not, therefore, possible to secure sufficient in that province to meet the demand, as the necessary qualifications were not possessed by the people of Bengal. He did not mean to imply that education would not encourage such a class, but his impression was that to get a carpenter of the standard of the master carpenter, or a man skilled in wrought iron work in Bengal, a Chinaman had to be chosen. His opinion was that as the Bengali was not an artificer by nature nothing would induce him to become an artificer, unless a promise of government employment was held out to him.

1,424. As an Executive Engineer he found the monthly accounts a great nuisance, but they had to be dealt with and an officer certainly received a great amount of information from them even though they absorbed a good deal of time, which might have been better employed on engineering work. This, however, depended on the amount of engineering work which had to be done by each particular Executive Engineer.

1,425. The government brickfield was under the Public Works Department, who received the rent and the lease from the contractor. He did not think the rent was put to the credit of the bricks. Though the market price of bricks varied in Calcutta, the price of government bricks was always nearly constant, so that the Public Works Department got no benefit if the price of privately-manufactured bricks went down very considerably.

1,426. He was the Secretary to Government in the Public Works Department, as well as a Chief Engineer,

and considered that the combination of the two posts was advantageous. He did not think the system was disadvantageous to other departments, and remarked that no complaints made against the Public Works Department on this account had come under his personal purview nor was it subversive of discipline in any way. He remarked that the Chief Engineer was not the final authority for an appeal, and that an appeal might be submitted to the local Government through the usual channel.

1,427. He was perfectly convinced that the supervision exercised by the Public Works Department over buildings constructed in Calcutta by them was satisfactory. Outside Calcutta, he explained, the personal question came in and this supervision depended a good deal on the men who were responsible for it.

1,428. (*Mr. Green.*) He had held the post of Superintending Engineer, Presidency Circle, before he was promoted to the post of Chief Engineer, and also the posts of Superintending Engineer, Central Circle, and Inspector of Local Works under the Local Self-Government Act, and as the last-named he inspected the offices of district engineers. In addition, he received estimates from district engineers for scrutiny, and was therefore in a good position to compare their rates with those of the Public Works Department. There was no great difference between the two sets of rates which were practically the same. Also as Superintending Engineer he received for scrutiny a number of estimates for grant-in-aid works. These estimates were really drawn up by contractors, and he found the rates entered to be generally slightly in advance of Public Works Department rates.

1,429. He admitted that his statement that the position of a particular contractor on the list of contractors depended on the opinion of the Executive Engineer was not quite right, because the sanction of the Superintending Engineer had first to be obtained to the classification.

1,430. At the Akra brickfield government kept a large reserve of bricks. This was of great help as bricks were thus available at a moment's notice for every conceivable contingency.

1,431. Occasionally, in the *mofussil*, when there was a stock of bricks available, a contractor was supplied with the bricks he required. It was not, however, the general practice to supply bricks to contractors in the *mofussil*. Government bricks were not sold to private persons.

1,432. Detailed estimates for repair work were submitted by the Executive Engineer's subordinates, not by the Executive Engineer himself. It would, undoubtedly, result in a great waste of money if the preparation and submission of these estimates were discontinued.

1,433. When government roads were made over to district boards in the nineties for maintenance, all government interest was absolutely ignored and, he thought, government lost a considerable number of acres by encroachment on the roadside and on government compounds during the period this system was in force.

1,434. (*President.*) It was a common experience in Bengal that inconvenience was caused to the Public Works Department by the present system of obtaining administrative sanction to a work, owing to frequent changes in the views of administrative departments, which in their turn necessitated the repeated revision of plans and estimates prepared for them. He added that here again the personal element influenced particular cases very largely.

1,435. Minor works in Bengal were those administratively sanctioned by civil officers, and the money limit for these officers varied. For the Director of Public Instruction it was Rs. 10,000; for the Board of Revenue, Inspector General of Prisons, Inspector-General of Police, Inspector-General of Civil Hospitals, and Commissioners of Divisions it was Rs. 5,000, for the Commissioner of Police, Calcutta, the Commissioner of Excise and Salt and the Directors of Land Records and Agriculture it was Rs. 2,500; for District Judges, and the Military Secretary to His Excellency the Governor it

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was Rs. 1,000; for the Chief Presidency Magistrate, Calcutta, and District Magistrates and Collectors it was Rs. 500, and for the Principals of Colleges it was Rs. 100. Therefore, a major work in one case might amount to Rs. 2,500 and in another case it might be only Rs. 150. Such a work, however, was not classed as a major work under the Public Works Department Code, and the classification of works in the Accounts Department depended not on the administrative sanction, but on the technical sanction of the Executive Engineer.

G. G. DEY, Esq., Superintending Engineer, Public Works Department.

Written Statement.

1,437. (*General.*)—In the first place, the consideration of the following questions must be looked at from two distinct standpoints:—

(1) that of a Public Works Department circle or division in a presidency town;

(2) that of a Public Works Department circle or division in the *mofussil*.

In the first case, the sites of works are within reasonable distance of each other, and one inspecting officer, with a bicycle or motor car, can supervise a number of works without an undue length of time spent in travelling. In the second case, which is the only one I am personally acquainted with, works are scattered, and more than half the time of an inspecting officer is taken up in travelling to and from the sites of works.

(2). The Northern circle, of which I am in charge, consists normally of three divisions, each held by an Executive Engineer, though at present there are four. One of these is a temporary division, and will eventually be absorbed by one of the others. Each Executive Engineer has three or four sub-divisions, in charge usually of an upper subordinate, but sometimes of a lower subordinate.

(3). The Darjeeling Division is a charge comprising one civil district, 1,164 square miles in extent, or nearly the size of an average English county. The area is small for a Public Works Department division, but comprises plains areas of 400 feet elevation, and hill areas up to 12,000 feet elevation, above M. S. level, cut into by deep ravines and gorges, which make travelling from one point to another slow and arduous. This charge is divided up into four sub-divisions.

(4). The Jalpaiguri Division consists of 4 civil districts, and is 9,767 square miles in area, or about the size of 7 English counties. The Public Works Department work in each district is in charge of a Public Works Department subordinate, and at the present time there are three more sub-divisions for the purpose of supervising heavy road and bridge construction work in the Duars. These sub-divisions will be reduced to two, or possibly one, when the actual construction work is finished.

(5). The Rajshahi Division consists of 3 civil districts, 8,027 square miles, or about 6 English counties, in area, with a Public Works Department subordinate in charge of each district.

(6). The extent of the whole circle is 18,958 square miles, and is equal to about one-third the area of England and Wales. The means of travelling are slow, and even in instances where the objective can be reached by rail, long waits at junctions discount many of the advantages, except to stations on the main lines between Darjeeling and Calcutta which are served direct by mail trains. In other cases long journeys have to be made by steamer, the service of which is so erratic, and timing so ill-fitting with train services, that a wait of 8 or 10 hours at a steamer station is nothing unusual. In other instances the sites of works such as police stations are so inaccessible that walking, or travelling by bullock cart, are the only means of inspecting.

1,438. (I.) *Economy and suitability of methods of execution of public works.*—At present, on receipt of sanction and allotment of funds for a civil work, tenders

1,436. He had not considered whether it would be an improvement if civil officers were given larger powers of administrative sanction than they had at present, and he did not think less trouble would be caused to the Public Works Department, in preparing plans and estimates and in executing works, if works now sanctioned by government were allowed to be administratively sanctioned by these civil officers. But he admitted that such a scheme might minimise the number of petty projects now sent up to the Chief Engineer for scrutiny.

from contractors are called for, a contractor of known capability is given the work. Either a piece-work agreement without time-limit, or a lump sum contract with time-limit for completion, is drawn up and accepted. Materials of variable quality, such as lime, cement, paint and iron-work are usually supplied by the Public Works Department to ensure a superior article being used, and the rates at which these are to be issued to the contractor are noted on his agreement, and accepted by him before starting work. The smaller class of contractor, which is the class usually available in the *mofussil*, nearly invariably prefers this method, as he usually works on borrowed capital carrying interest up to 36 per cent. per annum and sometimes more, which he cannot afford to lock up in purchasing the large amount of stores which are often necessary in executing works. More substantial contractors are allowed to supply their own materials subject to approval of quality by the Public Works Department staff.

(2). The generality of *mofussil* contractors are very little more than suppliers of labour. Work is laid out for them, they are usually shown how to do it, and it is supervised from start to finish by the Public Works Department staff. After completion, provided the local Public Works Department officer has worked conscientiously, it is known that the work, workmanship and materials used are the best attainable.

(3). I do not pretend that work done by the Public Works Department is as cheap as that done by local bodies, or by many private firms who are subject to their own supervision only, but there is no comparison between the standard of work in the two cases. Public Works Department work is carried out on high class specifications, ensuring a standard of excellence and durability which is not reached in cheaper forms of construction, and if that standard is to be maintained the supervising authorities must be the Public Works Department who have the traditions of past years to maintain. A complaint I have often heard is that the Public Works Department cannot build a cheap building. In this I differ; they can and do so when required, but the difficulty is to do it when another department is the requisitioning authority. Assume that such a building has been built, and that the officer who asked for it is satisfied and signs the completion certificate certifying that the work has been well done, and fulfils his requirements. In two years or three years the officer is transferred and his successor calls attention to the poor workmanship of the Public Works Department, because he has known that throughout his service a certain high standard of workmanship is expected from the Public Works Department. Again, buildings constructed by the Public Works Department are usually maintained by them afterwards, and the extra cost of repairing a building built of cheap materials is a thing to be avoided. Such considerations militate against any but the most durable form of construction, and for durability good and expensive materials and workmanship are essential.

(4) In the Despatch No. 12-Public Works, dated the 2nd June 1916, to the Secretary of State, a possible solution tending towards economy is suggested. It is proposed to hand over minor Public Works Department works to local bodies and private practitioners leaving the larger and more important schemes only to be

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carried out by Public Works agency, and it is suggested that possibly the same procedure as in England could be adopted, that is, that the engineers of the Public Works Department should become supervising engineers equivalent to Local Government Board inspectors.

I am not sufficiently acquainted with English methods to draw an accurate comparison but the position, as I understand it, is somewhat as follows:—

Superintending Engineers, drawing pay in India at £1,200 to £1,600 a year, would be equivalent to Deputy Inspectors drawing £900 to £1,000 in England.

Executive Engineers, drawing £640 to £1,000 a year, would be equivalent to Inspectors drawing £600 to £800 in England.

Sub-divisional officers or Assistant Engineers of the imperial establishment drawing £304 to £600 a year, and of the provincial establishment drawing £200 to £380 a year, would be equivalent to clerks of works drawing a salary which I have no means of ascertaining.

(5). In the Northern circle it is usual to have one, and sometimes two, imperial service Assistant Engineers in charge of sub-divisions, though at present there are none. There are in all 13 sub-divisions in the circle, and these are now all in charge of upper or lower sub-ordinates whose pay varies from £32 to £320 a year.

Sub-divisional officers have under them a class which has apparently no equivalent in England, though they carry out more or less the work done in England by clerks of works; these men are sectional officers drawing £24 to £56 a year; they are in direct charge of one or several works and are directly responsible to their sub-divisional officers for the quality of contractors' work, and adherence to specification.

(6). From Whittaker's Almanac I see that in England the staff for supervising engineering work is:—

- 1 Chief Engineering Inspector,
- 2 Deputy Engineering Inspectors, and
- 16 Engineering Inspectors.

under the Local Government Board, and I presume some clerks of works who find no place in Whittaker. In addition to these, engineers and surveyors form part of the establishment attached to the post office, surveyor's department, works and public buildings and other government departments, whose work is carried out in India by Public Works Department officers.

In the Northern circle which is about one-third the size of England and Wales, there is an engineering staff of 1 Superintending Engineer and 3 Executive Engineers, which is rather less than proportionate to the above, and 13 sub-divisional officers, about whom I can draw no comparison.

The result is inconclusive, as I cannot complete the comparison, but it appears that the engineering staff for supervision in India, though paid at a higher rate as compensation for foreign service, is not as numerous as in England, call them engineers, engineering inspectors, sub-engineers, overseers, clerks of works, or what you will.

(7). In conclusion, my contention is that the high salaried engineering staff of the Public Works Department is diluted with so very large a proportion of lower salaried staff to effect economy, which latter staff itself often requires close supervision, that any further reduction in engineers is a doubtful experiment.

Similarly, as explained in the preface, works are so scattered in a *mofussil* circle that any reduction in the subordinate staff is impossible, and even if all works were given out to private firms who could supply their own engineering staff, the government engineers would still be responsible for the class of work done. This supervision could not be carried out by a less number of men than is now engaged, though it might result in reducing the number of "sectional officers," provided private firms could reach a standard of honesty and workmanship which did not require the constant assistance and supervision which is now given by the subordinates of the Public Works Department.

1.439. (II.) Encouragement of other agency.—There appears to be some misunderstanding as to the methods

of carrying out work now followed by the Public Works Department. Practically no work is done departmentally, the agency employed is nearly invariably contract, and work is carried out under the general supervision and instructions of the Public Works Department staff, who show the contractor how to lay out and do his work and help him through every difficulty when his technical or practical knowledge is insufficient.

(2). Out of 17 years' service, of which 1½ were spent on leave, I have been stationed for 7½ years on pure construction and for 4 more years in charge of the Darjeeling Division when construction formed the major part of the work of the division. Less than ½ per cent. of the work done was done departmentally and the same applies to repair work, which is borne out by a scrutiny of the items of work for which contract rates are entered in the Public Works Department schedule of rates.

(3). I do not see how it is possible to encourage private enterprise further and it is well-known throughout Bengal that work done by the Public Works Department is all open to contract.

There are, however, very few *mofussil* contractors who are educated up to a standard which would enable them to carry out works on any form of contract without supervision and constant assistance from trained men such as the Public Works Department now provides.

It may be argued that, until the education of the *mofussil* contractor is more advanced, private firms in presidency towns could be given *mofussil* work. I have seen two such instances: the work was given out at rates 15 to 20 per cent. above those given to Indian contractors working alongside, and a time-limit was imposed. The work done was fairly good, but no better than that done by the Indian contractors, the time-limit was exceeded, and when government imposed the penalty litigation was only avoided by a lengthy and costly arbitration.

I do not imply that private enterprise should not be encouraged—the Public Works Department do all in their power to encourage it—but the time has not yet come when works can be handed over to a private firm to carry out by means of its own engineering staff without close and constant supervision by government engineers. I have never yet had experience of such a firm in the *mofussil*.

(4). In paragraph 9 of the Despatch No. 12-Public Works to the Secretary of State, it is suggested that all small government works could be undertaken by local bodies, and only larger and more complicated enterprises undertaken by government agency. The suggestion is no new one, and was tried between the years 1892 and 1897 by handing over the maintenance of both imperial and provincial Public Works Department buildings in this circle to the various district boards. Owing to the earthquake in 1897 the works in the Rajshahi Commissionership were resumed by government as heavy special repairs, and in some cases reconstruction of buildings were necessary.

In 1899* when it was proposed to retransfer the Public Works Department buildings to the district boards 6 out of 11† district boards refused to again take up maintenance, as they considered that the 15 per cent. for supervision offered by government was insufficient. The remainder took it up, and during the year 1905 the procedure was dropped, as I understand it was found that the work done was not up to the standard of that done by Public Works Department officers.

During 1914-15 the cost of works in the Rajshahi and Jalpaiguri Divisions was Rs. 8,89,125, and the cost of

*Vide Bengal Government, Public Works Department, Resolution No. 775E., of 22nd March 1899.

† Rajshahi.	Purnea.
Rangpur.	Bogra.
Bhagalpur.	Sonthal Parganas.
Jalpaiguri.	Malda.
Dinajpur.	Monghyr.
Pubna.	

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establishment employed, including their travelling allowances and contingencies and including all office establishment and tools and plant was Rs. 95,964, giving a percentage of 11 per cent. on works. In 1913-14 the establishment percentage was 15 per cent. on the cost of work (works Rs. 6,24,972, establishment Rs. 94,080).

If the giving over of the minor works to local bodies entails an establishment charge of 15 per cent. or more on the cost of those works, I do not see that any real economy is effected.

(5). The works mentioned in paragraph 9 of the despatch, i.e., non-government school buildings, hospitals and dispensaries for which government gives a grant, and village and small urban sanitation schemes, are nearly all carried out now in Bengal by district boards and municipalities or local committees, and there is no reason why private practitioners should not take over the carrying out of such work when they are educated up to it, but this change would not affect the Public Works Department. Local bodies, however, often ask the Public Works Department to carry out contribution works on their behalf in preference to trying local contractors, as they have very little knowledge of dealing with these men, and in addition are certain of the standard of Public Works Department work.

(6). It is the preparation of estimates for, and construction of, small buildings and works costing less than Rs. 5,000, and estimating for carrying out annual repairs and petty alterations to numerous buildings which takes up the time of the Public Works Department staff, the handing over of which would afford relief and give opportunity for a reduction in Public Works Department establishment.

In the Northern circle there are 835 main imperial and provincial civil buildings, most of which have several subsidiary buildings, amounting to about 2,000 in the case of the Rajshahi Division alone, and estimates for maintenance have to be prepared annually for each. In the majority of cases the amounts of these estimates are less than Rs. 500, and do not require a high order of engineering training for their preparation. Yet each estimate is handled by every officer from a sectional officer up to an Executive Engineer, and in some cases final scrutiny and approval by the Superintending Engineer is necessary.

Again, needless requisitions are constantly received from other administrative departments to prepare estimates for new work and alterations to buildings, much of which there is no possibility of financing or taking up for years after. Such estimates require considerable preliminary work and the use of staff which there would otherwise be no need to entertain.

(7). I have formed no idea of how the reduction of staff could be effected. If the work were handed over to the district boards, the district engineer's executive and office establishment would require strengthening by an amount which I should roughly estimate at 20 to 25 per cent. on the cost of works. Government would have to find this money and the economy effected would be the pensions of such of the Public Works Department subordinate staff as could be dispensed with owing to the change.

(8). Before advocating that any subordinate Public Works Department establishment should be dispensed with, I would point out that the reason of the existence of such establishment is that the whole of technical education in India starts on a lower footing than in England. In India tradesmen, e.g., carpenters, masons, blacksmiths, etc., though individually skilled in their own actual trade, know nothing of its application to construction. They have been taught to translate orders in particular cases only and not in a general sense, and are therefore of little or no use in supervision. For supervision a trained subordinate is required and under existing circumstances that trained subordinate, corresponding to a clerk of works in England, is a Public Works Department subordinate drawing, I imagine, much the same pay as his equivalent in England. Before such subordinates can be dispensed with technical educa-

tion in India must be so revolutionised and improved that the skilled tradesman, trained to interpret orders generally and to supervise works directly, can work himself into a position to replace them.

(9). Again, at present the "high salaried officer" of the imperial and provincial branches of the Public Works Department must start from the bottom rung of the ladder as an Assistant Engineer; he must be his own clerk of works assisted by his government subordinates only; show his workmen how to apply their trade knowledge, and by constant inspection see that his instructions are carried out. In England he would have skilled tradesmen to help him, in India he must learn every trade connected with his profession and apply his knowledge. The training of an Assistant Engineer, in addition to acquiring such knowledge, comprises the study of people of a foreign country, their peculiarities, their religion and their prejudices, and when he has fulfilled all that can be done in the nine years or so of his Assistant Engineership, he is fit to be made an Executive Engineer and exercise the same functions, with rather increased powers, over his Assistant Engineers and sub-divisional officers. Instead of actually supervising several works minutely and in detail, he issues his instructions, but nevertheless his inspections must be frequent, and in the case of indifferent sub-divisional officers, or of work of abnormal complexity, more than frequent. After several years as Executive Engineer, the fittest are selected as Superintending Engineers and in due time may become Chief Engineers. From the above it follows that the training of an Indian engineer is entirely different from his English *compère*. In India the whole engineering profession starts on a very practical basis, whereas in England the practical part is done by skilled tradesmen and the engineer supervises and often becomes purely a consulting engineer. To bring the two into line it will be necessary to bring technical education to a high pitch to replace the lower subordinates now in government service. Even then government engineers must start in service early in life and study administration, and the workmen they have to deal with, before they can be successful in dealing with engineering work in India.

(10). In the latter portion of paragraph 9 of the despatch it is stated that there are probably districts where the local bodies could at once take in hand their own engineering work, but they already do this in practically every district in Bengal, and the question of taking over minor government works is one which depends on funds for works and extra establishment. The generality of district engineers, whose work I have seen, have not sufficient ability to design and carry out large schemes such as now fall within the scope of an Executive Engineer's duties, but as it is not proposed to hand over such work to local bodies at present the point needs no discussion under the present head, but it does affect the question of recruitment of government engineers.

In paragraph 9 of the despatch it is suggested that eventually government engineers could be recruited from the best of the talent available amongst the engineering establishment of local bodies and from amongst private practitioners; I consider that the standard of ability now obtaining among district engineers is not nearly high enough to fit them for appointments as government engineers. With improved education they may, and even now often do, attain the necessary technical qualifications, but amongst such of the engineers trained in Indian colleges, as I have come across there is usually a lack of capacity for administration, which means so much in engineering work in India.

(11). One suggestion for lowering rates for work is to give Superintending Engineers the power to make advances to contractors up to a specified amount. The profits of *wofussil* contractors are largely consumed by heavy rates of interest paid on borrowed capital on which most of them work. Remove this drawback and the rates would automatically fall.

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1,440. (IV.) Relations with other departments and sub-branches.—The former part of the question, it seems to me, is for the other departments of the administration to answer. Also as regards the latter part the opinions of the Government Architect, Sanitary Engineer and Electric Engineer and Inspector are required, but my experience has been that the relations are entirely satisfactory.

(2). I have certainly had complaints from other departments of the high cost of work done by the Public Works Department, and occasionally of slow progress. To the former the answer is that first-class work cannot be anything but expensive, and the latter was nearly invariably due to want of energy on the part of the Public Works Department subordinate staff, which usually requires to be kept up to the mark.

1,441. (V.) Decentralization.—I cannot see that further decentralization is desirable. As regards responsibility, the establishment chain from Chief Engineer to sectional officer is clearly defined and could not well be altered. As regards powers of sanction to estimates and acceptance of tenders, the limits imposed on Superintending and Executive Engineers are practicable and not irksome. The limits of these powers have been increased from time to time and are now as wide as it is safe to extend them, except possibly in individual cases amongst Executive Engineers, but transfers amongst Executive Engineers are too frequent to allow of individual officers being exempted from fixed limitations.

1,442. (VI.) Simplification of procedure.—I do not consider that the provisions of the Code are unduly restrictive. The procedure has been outlined in the memorandum prepared for the information of the Committee.

(2). The meticulous nature of the regulations embodied in the Public Works Department Code, which is referred to in paragraph 7 of the despatch, is the natural evolution of an attempt to deal with all possible specific cases and provide a rigid solution which admits of no loophole for misunderstanding. Compare the Public Works Department Code with the Civil Service Regulations, or the Civil Accounts Code, and the same minute details are gone into in every one of them. I admit the inelasticity of many of the rulings laid down, but it is usually the Accounts Department which insists on a rigid adherence to such rulings, and I consider that more latitude should be given to executive officers, who could often avoid much correspondence and delay if more were left to their discretion. As an Executive Engineer I was constantly met by accounts objections to the most economical and commonsense methods of dealing with executive problems. I will mention a single instance which is typical of such objections. In the Darjeeling district the Public Works Department inspection bungalows are provided with crockery, cutlery and glass marked with a badge to show that they are the property of government. In case of breakage the value is paid by the occupant of the bungalow to the bungalow *chaukidar* and credited to government revenue. In order to save freight from Calcutta, packing charges and delay entailed by purchasing one article at a time as breakages occurred, I purchased a small stock of the most breakable articles so as to replace breakages quickly, but the procedure was held to be most objectionable at the next audit inspection of my office and a cumbersome procedure which was not liable to accounts objections was inaugurated.

(3). The most serious obstruction to ordinary executive work is the practice followed by all accounts inspect-

ing officers of drawing a comparison between expenditure during the last three months of the financial year and other months. When the expenditure is considerably heavier in January, February and March than in other months, and it usually is, disparaging remarks amounting to censure are passed on the methods of carrying out work adopted by the officer whose office is being inspected. Such emphasis has been laid on the heinousness of this offence that a review of Public Works Department work by the Comptroller-General of India pointing out the practice has called forth particular injunctions from the Secretary of State to discontinue it.

Although I agree entirely that it is highly undesirable to allow a rush of heavy payments in March, with a probability of bills being passed and paid without proper check and scrutiny, I absolutely disagree with the criterion aimed at by the account officers, which is that expenditure on public works should be spread out evenly over every month of the year.

When it is taken into consideration that, apart from Calcutta where large stocks of bricks and other materials are available for work throughout the year, the working season in the *mofussil* is clearly defined as from the 15th October to the 15th June at latest, i.e., the dry season, it is impracticable to work up to the *desideratum* laid down by the Accounts Department. Apart from brick manufacture which can only be started advantageously between the 15th October, after the rain ceases, and the 31st December other materials can only be carted to sites of many *mofussil* works during the cold and hot weather, when the cart tracks leading to them are fit for carts to use.

March is a month which happens to fall about the middle of the working season, and it is only to be expected that expenditure will be heavy when work is heaviest. It is unfortunate that this should coincide with the last month of the financial year, and the only solution I can offer is that, if the objection is of so much importance, the financial year should end, say, in August. A possible alternative is that amounts which it is impossible to spend within the year, if surrendered say by the end of January, should be available for reallocation after the 31st March.

1,443. (VIII.) Practical training.—Students from English colleges are now appointed on probation for two years, and students from Indian colleges serve a year's studentship, and a year's apprenticeship in the Department in addition in the case of an Assistant Engineership. Students from England enter the Department direct and are usually placed under a sub-divisional officer to acquire practical knowledge, or may in special cases be put in direct charge of a Public Works Department sub-division.

Students from Indian colleges are usually put under a sub-divisional officer, with instructions to take notes in a note book, of which the type is laid down from time to time by their college authorities. These note books are scrutinized and commented on by the Executive Engineer, who must certify that the notes taken are satisfactory before the student can draw his monthly stipend. Neither student is as a general rule put in direct charge of any particular work, and they are usually posted to any sub-division where there is a chance of obtaining practical knowledge on construction work. The training they go through is as practical as it is possible to devise. It depends very much on the class of new work going on to which the student can be posted, but I see no way of bettering the present method.

MR. G. G. DEY called and examined.

1,444. (*President.*) The witness stated that he was a Superintending Engineer and had been employed in the Public Works Department for about seventeen years. In the earlier part of his service he had served in the Irrigation Branch, but he had been in the Buildings and Roads Branch for the last eight or nine years. Except for Darjeeling, his experience was mainly limited to the *mofussil*.

1,445. It was the practice of the Public Works Department to call for tenders in the case of large contracts, usually on the piece-work, and not the lump sum system. The latter course was occasionally followed in case of urgency when a work had to be done in a hurry and within a stipulated period of time. It was not usual to split up a project into small portions and call for tenders for each, but generally the whole work was

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given out on one contract, payment being made on actual measurement. Rates were called for for each separate item, for masonry work, wood work, etc. It was usual to give the work to the contractor who submitted the lowest tender, provided the Executive Engineer was satisfied that the man was able to do the work properly. In the *mofussil* there was a type of contractor who submitted low tenders in order to get work which, however, he could not execute properly.

1,446. He had had experience of large building works in the *mofussil*, the largest group of buildings he had constructed having cost Rs. 6,00,000 or Rs. 7,00,000. This was additions and alterations to Government House at Darjeeling, and the construction of several buildings subsidiary to the main building, which had had to be constructed in a very short space of time (between November and the following March), and in order to expedite the work some portions were given to local contractors, and certain Calcutta contractors were asked to undertake others.

1,447. It was not the practice in the *mofussil* to call for a single tender for a whole work in the case of large works, as there were no contractors big enough to take up a large contract, and the Calcutta contractors would not leave the presidency town unless special inducements were offered. The conditions of work in the district were very difficult as there were no large firms of contractors capable of undertaking big works; there were none at least in the witness's circle. He knew of one big contractor in Muzaffarpur, in Bihar and Orissa, who took up large contracts.

1,448. Lime, cement etc., were usually supplied by the Public Works Department so as to ensure good quality, and also because the petty contractors available could not afford to lock up their capital in getting stores, as payments for so-called "materials at site" were prohibited. Bricks were usually supplied by the contractors and very seldom by the Public Works Department. Large contractors sometimes supplied lime and cement, subject to approval by the Department of the quality. He admitted that the quality offered could be settled in the specifications but contended that there was nothing to prevent contractors from supplying bad material unless they were very carefully supervised.

1,449. The Public Works Department rates were not so low as those of local bodies and private firms, but the Public Works Department standard of work was superior. He pointed out that though the district boards were supposed to work up to the same standard of efficiency as the Public Works Department they were somewhat slipshod in their methods and their supervision was not as good as that of the Public Works Department. Their specifications were supposed to be the same, but these were not rigidly adhered to. In fact, the district boards had not sufficient staff to exercise the same close supervision as the Public Works Department. District board rates were approximately the same as those of the Public Works Department, but in some cases were slightly lower.

1,450. He did not consider that the specifications of the Public Works Department were unduly high. If buildings were to be built for durability, specifications must be high. They could be lowered considerably if the buildings were required for temporary use, or for only a limited period of years. He did not think that the specifications for such buildings as police stations, hospitals, schools, and residences for officers, which he had to build in his division, were too high and was unwilling to advocate lowering them.

1,451. In regard to the system of transferring works to local bodies, which was tried in 1892-1897, and referred to in his written evidence, he could give no further information as he had had no practical experience of the working of the scheme. Six of the eleven district boards had refused to take up the maintenance of such works again when a similar proposal was made later. The reason given by one of the district boards was that the 15 per cent. for establishment offered by government was insufficient to cover the cost of supervision,

and a higher percentage was asked for. In referring in his written memorandum to "local bodies" who applied to the Public Works Department to take up their works, he intended to refer to school committees, road cess committees, municipalities, etc., and not to district boards. Such bodies preferred to get their work done by the Public Works Department in preference to district boards presumably because they considered that the Public Works Department turned out better work. The percentage charged by the Public Works Department for contribution works of this sort was 24½ including tools and plant and supervision charges.

1,452. Provincial roads were constructed and maintained by government and the witness was unable to say whether these had also been transferred to the district boards in 1892-97. Besides these there were other roads maintained by the district boards. Classes of roads varied from first-class metalled roads to unmetalled and unbridged roads, and most of the provincial roads were metalled; most of the district board roads were unmetalled, but bridged throughout except in the case of large rivers. District boards did not usually maintain first-class metalled roads at the same standard of efficiency as the Public Works Department, but the witness had not compared the cost of maintenance under the two systems. He did not think that the existing system under which the Public Works Department and district board staff looked after their own roads and buildings led to much duplication of staff. He admitted, however, that it entailed two agencies looking after works in the same area, and agreed that, provided efficiency were ensured, one agency might be substituted. He did not think, however, that it would lead to much saving in establishment. Nor did he think it proper, to make over the maintenance of roads and government buildings to district boards, as the experiment had been tried and failed. He had no practical experience, but assumed that the experiment had not proved a success because the roads were not looked after as carefully as they should have been. He could not say, however, whether this was due to the inadequacy of the staff or to what other cause, but remarked that there was a limit to the amount of work which could be efficiently supervised by one district engineer.

1,453. It was his experience that considerable time was wasted in the preparation of unnecessary plans and estimates, which fact was probably due to plans and estimates being called for without due consideration as to whether the works were really necessary and could be financed. He had had to prepare plans and estimates for buildings costing Rs. 10,00,000. In over two years less than Rs. 80,000 were spent on these works and most of them had not been carried out yet, nor was there any likelihood of their being ever carried out. Heads of departments could call for plans and estimates, for any amount, without getting government sanction. The only remedy he could suggest was that requisitioning departments should certify before calling for plans that there were prospects of the work being carried out within a reasonable period, say two years. Requisitioning departments also very frequently changed their views thus necessitating the continual recasting of plans and estimates. These changes were often made even in the detailed plans and estimates, and were often due to changes in the *personnel* of the heads of departments. The different stages for the preparation of plans and estimates were as follows:—If the cost was above a certain sum the department asked for a rough plan and estimate. These were sent to the requisitioning department for administrative sanction. After administrative sanction had been obtained, detailed plans and estimates were called for, provided there were some chances of the work being put in hand in the near future. This last condition was, however, not observed. The detailed plans and estimates were submitted for technical sanction. He did not think, however, that it would meet the case to lay down that the requisitioning department should be bound by its first administrative sanction, and not allowed to make changes afterwards, as with such restric-

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tions in force the building when completed might not suit the requirements of the department.

1,454. Road repairs were carried out by contract, contracts being given for collection of material, consolidation of metal, earthwork, bridge repairs, etc. In the hills, but not in the plains, maintenance gangs were employed. Repairs were generally executed by contract at particular periods of the year but when urgent repairs were required petty contractors were asked to take them up at once. Separate plans and estimates were not prepared for such repairs, but they were incorporated in the annual estimates. It depended upon the particular district whether road construction was given to contractors in large lengths or in small sections, but usually contractors able to take long lengths of road were not available, so that the general practice was to give short lengths of from half a mile to five miles to each contractor. They could not take longer lengths as they could not raise sufficient funds, and even if it were desirable to give out long lengths contractors would not be forthcoming to take them up. He instanced the case of a road in the Dooars, an unhealthy part of the province where it had been extremely difficult to get contractors big enough to take any considerable length. This was not due entirely to the unhealthiness of the district, but also to the fact that contractors in the *mofussil* had in some cases failed to carry out their contracts even in the case of short lengths of half a mile or so of road.

1,455. There was no fixed allotment per mile, even in the budget. It varied from year to year.

1,456. Repairs to buildings also were generally done by contract, and if the work was big enough tenders were called for. The preparation of plans and estimates for petty repairs absorbed a considerable amount of the time of the staff, but the witness could not suggest how this could be remedied. He did not think that it would be a satisfactory system if an allotment allowing lump sums for each building were made each year to the Executive Engineer for repairs, to be spent at his discretion, as without estimates it would not be possible to say whether the money had been properly spent. Standard measurement books (though it had been difficult for the establishment to find time to prepare standard measurements, and the work was one which had been shirked by the subordinate staff in the witness' circle) had recently been introduced and were of some advantage, but they did not fully meet the case, as sometimes the whole of the building was not repaired at one time, for instance the painting of doors and windows was done in certain rooms only. The witness stated that the painting of the whole building was generally done once in four years, if it were kept in proper repair from the beginning. He considered that, in addition to the standard measurement books, it was necessary that there should be some check to ensure that the whole of the work had been done. If there were no estimates there would be no means of seeing whether the money allotted for a particular building was for the whole, or part of it only. He admitted that standard measurements had considerably reduced the amount of work involved in preparing estimates but did not consider that any further simplification of the procedure was possible.

1,457. Superintending Engineers possessed powers of technical sanction up to Rs. 50,000 and Executive Engineers up to Rs. 2,500. He considered the latter quite sufficient and was of opinion that, as a class, Executive Engineers could not be given higher powers in spite of the fact that there was so large a difference between the powers of the Superintending and Executive Engineers. Selected Executive Engineers might however be given somewhat higher powers.

1,458. Sub-divisional officers had no powers of sanction, and he did not think that they should be given any. Out of fifteen sub-divisional officers he had four were simply lower subordinates on Rs. 40 a month. These men had probably been selected, as upper subordinates were not available. As a rule all payments were made by the Executive Engineers and none by the

sub-divisional officers. The latter could make individual payments up to Rs. 10 only except for works establishment, and were given imprests varying between Rs. 50 and Rs. 500.

1,459. He considered that the accounts work of the Executive Engineer took up a very considerable amount of his time. Roughly speaking, he had on an average to spend about two hours a day on this work. An Executive Engineer derived some benefit from attending to this accounts work, but it was done at the expense of his executive duties. He was greatly in favour of the simplification of accounts, but could not suggest the lines on which it should proceed. He stated that the monthly accounts took up most of the time, but added that their examination helped the Executive Engineer to point out mistakes and see if there was any shortage or excess of expenditure. That benefit could however, perhaps still be derived if the accounts were simplified.

1,460. There was an accountant in the Executive Engineer's office but he was debarred from corresponding direct with the Accounts Department, and all such correspondence had to be conducted by the Executive Engineer. The witness considered that the accounts required some control by the Executive Engineer and that there must be something to show the latter that his money had been properly spent. Provided, however, that the Executive Engineer kept his own cash book, vouchers and register of works it would be a great relief if the accountant were made independent, and the compilation of the monthly returns were done in the Accountant General's office; he did not see any objection to this course.

1,461. The witness had had a considerable experience of the upper subordinates turned out of the Sibpur College. As far as their technical qualifications were concerned they were suitable. They should, however, be given more practical training. He did not think that their theoretical training was too high for their requirements as sub-divisional officers. In regard to the lower subordinates, he thought that they should get less technical, and considerably more practical training. He was in favour of the employment of men of the *mistri* class on construction work, in preference to sub-overseers, provided they were sufficiently intelligent, could read and write, and understand figures and orders. If, in addition, they knew survey work they would prove more useful than the present lower subordinates on practical work. The formation of two classes of lower subordinates, one of *mistris* and the other of surveyors and estimators would, he considered, be a great improvement on the existing system. In his division he had one or two *mistris* who were fit to replace lower subordinates and were as useful as sub-overseers, if not more so. The better class of *mistris* could read and write. These *mistris* were employed on construction works and road making and were charged to works establishment.

1,462. (*Mr. Cobb.*) By the sentence "technical education in India starts on a lower footing than in England" occurring in his written memorandum, he wished to convey that secondary education in India did not reach a very high pitch.

1,463. As to how to get men of the *mistri* class, the witness stated that there was a class of men in the Darjeeling district who would, with a little education, make very good *mistris*. These men got their training as they went about their work, but it would be still better if there were technical schools for them. He considered it would be quite possible to start a technical school in the Darjeeling district. At present there was only an Anglo-Indian Home at Kalimpong which gave instruction in carpentry, etc. He was of opinion that indigenous craftsmen made very good *mistris* and that generally with each generation the son was better educated than his father. If these men were given a little encouragement they would make very useful *mistris*.

1,464. The witness had very little experience of local boards. He did not think there was much genuine public spirit among the members of district boards,

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who generally looked to the interests of their own district only.

1,465. Lump sum contracts were not generally given in the *mofussil*, as petty contractors did not understand them, and preferred payment by piece-work. In his division, there were two Chinamen who worked on the lump sum system and preferred to do so. The work in their case was more economical, but there were not many contractors of this type.

1,466. Bricks were very seldom purchased in the open market as they were usually manufactured by the Department through its contractors. The rate for first-class bricks varied from Rs. 16 to Rs. 18 per thousand.

1,467. (*Rai Bahadur Ganga Ram.*) This rate was very high compared with that of the Punjab which was only Rs. 9 per thousand. The increase, however, was due to the difference in the cost of labour.

1,468. An allowance was sometimes made in estimates for works establishment, but not at any particular percentage rate. There was no rule in the Public Works Department Code which regulated the amount of the allowance.

1,469. Sub-divisional officers were not permitted to keep any drawing accounts. All payments were made by the Executive Engineer who drew cheques and passed them on to the sub-divisional officer. This arrangement was not due to the situation of the sub-divisions, nor to distrust of sub-divisional officers. It was merely in force because there was no necessity to give sub-divisional officers this power.

1,470. He considered it would be expedient to introduce a system under which inefficient could be weeded out, and was in favour of allowing good men the option of retiring earlier if they desired to take up private practice.

1,471. He believed that some of the men turned out by the Sibpur College obtained employment under district boards and that others took to private practice, but could not say definitely whether any set up as private contractors. He did not know whether any contractor in his division was a passed student of the college.

1,472. He considered that the margin of 12½ per cent. usually allowed as profit in addition to the cost of labour and materials, should, as a rule, be sufficient to attract good contractors.

1,473. The two or three good *mistris* he had referred to were not Bengalees but *Paharis*. He had not come across any good Bengali *mistris*, but had experience of several Punjabi *mistris*. These latter were generally good workmen.

1,474. (*Mr. Mackenzie.*) Certain stores had to be obtained from Europe, but the witness was unable to say whether there was any method of ascertaining whether the price and quality were favourable in comparison with the quotations of the Director General of Stores. He had not had frequent occasion to indent for European stores, and articles were usually obtained in India unless there was ample time and it was possible to foresee sufficiently far ahead what stores would be required. Since the war there had been difficulty in regard to the purchase of steel.

1,475. (*Sir Noel Kershaw.*) His reference to inspecting officers in the preface to his written evidence included Executive Engineers. He had no personal knowledge of the details connected with the transfer of certain works to local bodies during the period 1892-1897, but he believed the works made over included both construction and maintenance. (This was confirmed by Mr. Green who explained that all classes of work, irrespective of their magnitude and including both construction and maintenance were handed over to certain district boards in Bengal.)

1,476. (*Rai Bahadur Ganga Ram.*) His experience of obtaining stores by indent from the India Office was very limited. The only large indent which he had sent home was for materials for a bridge which he was

certain were not obtainable in India. He had no means of ascertaining what articles of indigenous manufacture were available in India except from the ordinary list, which was perhaps obsolete.

1,477. (*Mr. Green.*) His charge extended over the whole of Northern Bengal, and in that area there was not a single large contractor to whom a large contract could be entrusted without departmental supervision. This absence of large contractors was possibly due to the paucity of work obtainable from private sources. In a district like Rajshahi houses were continually being built, some of which were of fairly large size, but Indians either built their own houses or engaged the same class of contractors which the Public Works Department employed. The works of the value of 6 or 7 lakhs of rupees to which he had referred consisted of a group of buildings aggregating that amount. They had to be executed in a hurry and the very process of calling for quotations, which was necessary in the case of single contractors for large contracts, would have entailed delay which could not be borne. No single contractor could have taken up the whole work which included plumbing, electric lighting, water-supply and heating, without employing sub-contractors and consequently introducing middlemen's profits. No single contractor besides could have finished the work in the time without an intimate knowledge of materials and labour which the Public Works Department staff supplied.

1,478. The charge of 24½ per cent. for contribution works was based on a codified rule and had nothing whatever to do with local conditions. He could not say whether it was based on past actuals. Occasionally, private bodies were charged 10 per cent. only.

1,479. Very little labour was employed for road maintenance, and repairs were generally done by contract. Separate estimates were framed for the several items, *viz.*, collection of metal, metal consolidation, earth-work, etc., and work was not given out at a uniform rate.

1,480. He stated that under present conditions the Executive Engineer was allotted a large grant for repairs to buildings, and that he could utilize this within reason as he liked. Repair estimates were prepared by sub-divisional officers and not by the Executive Engineer. They enabled the latter to watch his expenditure and were necessary as the Executive Engineer was required to exercise an efficient control over his repair grant.

1,481. Executive Engineers had recently been relieved to some extent of the compilation of certain accounts, *e.g.*, the "Register of Works" and the "Schedule of Expenditure against Budget Grants." These were formerly prepared in divisional offices, but were now compiled in the office of the local Accountant-General.

1,482. (*President.*) By virtue of his appointment as Superintending Engineer, he was the Inspector of Works of district boards, and plans and estimates amounting to Rs. 2,500 and over were submitted to him for technical approval. His estimator checked the actual calculations, and he himself scrutinised the plans from a technical standpoint. At present this did not absorb much of his time because district boards had not very many building projects in hand. They had several road projects but these hardly involved any work for a Superintending Engineer. Practically only an arithmetical check was necessary, except in the case of bridges and culverts, and as a rule this was not attended to by the Superintending Engineer.

1,483. As Inspector of Works he was obliged to inspect the district engineers' offices once a year, and to inspect the work of the district engineer in whose district he happened to be on tour, but he could not interfere with the work nor enforce instructions on the district engineers if he found work was being improperly executed. All he could do was to refer to the matter in his inspection note, a copy of which he forwarded to the Deputy Commissioner or Collector of the district, in his capacity as chairman of the board, and to the district engineer concerned.

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RAI BAHADUR AMAR NATH DAS.

[Continued.]

RAI BAHADUR AMAR NATH DAS, Superintending Engineer, Public Works Department.

Written Statement.

1,484. (I) **Economy and suitability of methods of execution of public works.**—The methods adopted at present for the execution of civil works outside Calcutta are, I consider, economical. Even in Calcutta I consider they are economical compared with the system proposed.

(2). I am not in possession of figures for actual outlay on works and the actual cost of the establishment employed. The Accountant-General, Bengal's, Finance Accounts for 1915-16 shows that the establishment charges on imperial civil works was 21·8 per cent. on the outlay on works and repairs and the corresponding charge for provincial civil works came to 23·3 per cent. These charges appear to be very high superficially, but examining the details it will be observed the establishment charges include items which have nothing to do with the "outlay on works," e.g.—

	Rs.
Sanitary Engineer's establishment	98,889
Arboriculture Expert	9,713
Consulting Architect's establishment	34,089, etc

If these charges are eliminated out of the total of Rs. 13,83,557, the percentage would work out to below 20 per cent. for imperial civil works and below 21 per cent. for provincial civil works.

(3). The charges for direction establishment amount to Rs. 3,23,257 out of a total of about 12½ lakhs on total establishment charges on work proper; this represents about 25 per cent. of the total establishment charges and would remain the same. If this is eliminated the balance of establishment charges left would be about 15 per cent. on the outlay on works. This is not high if it is borne in mind that under the present system the Public Works Department has been able to get work done at a cheaper rate than it could be done if firms of high standing or contractors of high professional qualifications were employed. It is not possible to gauge this with any accuracy, but I would certainly think that 10 to 20 per cent. higher rates will have to be paid. This would mean that there will be no economy in the method proposed whereas there will certainly be great loss of efficiency.

(4). So far in Bengal there has not been a large number of firms of high standing, the result is that there is no healthy competition and that high rates are dictated by such firms. Under the present system of the Public Works Department it has been found possible to have work done by contractors, who are either ordinary business men or engineers and upper subordinates turned out from Indian colleges, at reasonable rates. Success in this direction has also tended to bring down the rates of the few firms of high standing in Calcutta. I am glad to find that of late some of these contractors trained in the Public Works Department and Railways have now also the confidence of the public. This result is, I understand, what is desired by government. Until there is a sufficiently large number of firms of standing in Calcutta, which will tend to keep down rates by a healthy competition, the result of the proposed system may be exactly contrary to the wishes of the government. The men turned out from Indian colleges will necessarily be small investors, and it will take no time for the few firms of standing to extirpate any competitors in their field. A firm of standing employing a large number of responsible officers has nothing to lose. If bad work is discovered they rectify and remove the man in direct charge to some other work, and his loss on this work is recouped from profits on other works under Public Works Department. An engineer working on his own account on a small scale will perhaps in a similar case be removed from the list of contractors, and over and above his immediate financial loss, his future career will be ruined. If ultimately the distributing of contracts resolves itself into a division of

these works to a small number of firms of high standing at whatever rates they choose to fix, the result will be exactly the reverse of what the intentions of the government are.

(5). My experience of buildings works in Calcutta is of short duration, but what I found was that firms of high standing would not come to submit tenders for the smaller Public Works Department works, where such tenders were called for by public advertisements. I could only put it down to the fact that they realized that the rates paid by the Public Works Department were low for them. It is only when the number of these firms have sufficiently multiplied themselves, and professional engineer-contractors from Indian colleges have been introduced under the present system, that the proposed system can be adopted with advantage. If it is introduced now, I am afraid government will have to pay for works 20 to 30 per cent. more than under the existing system, and Indian college engineers, instead of obtaining the few appointments now in the Public Works Department, will be under the employ of the few big firms on smaller pay, and the eventual result will be a deterioration in the class of recruits to these colleges.

(6). In Bengal towns, there has been no growth of employment of the engineer as a private practitioner. In the premier city of Calcutta there are only a few private practitioner engineers and architects. Some of these are employed on partition of landed properties and some in the employ of the big firms. There is no scope for more at present. Things are however moving slowly. Twenty years ago it was only the lawyer who could make a decent living on private practice; the medical profession had not much then, but now they have. The engineer has not made a fair start, but I think it is just starting. People in Calcutta would spend Rs. 10,000 to contest a property worth Rs. 10,000 even where he is himself doubtful of his claims. They would now obtain medical advice at a fair value, though they would not be so free in expenditure as in the case of law suit. If they would build a house which will cost Rs. 50,000 they would not think of employing the architect and engineer. They would get hold of the modest amateur draughtsman and have a plan drawn which is good enough to get through the municipal office. Until people have realized the advantages of obtaining the best professional advice, there will not be field enough for the private practitioner. Government buildings alone can but support a small number. Until these conditions are altered, I do not think that there will be a growth of private enterprise with advantage to government under the proposed system. I am however sanguine that these results will be obtained if the present system continues for a few years to come but am afraid it will be a retrograde movement if the system proposed is introduced prematurely.

1,485. (II) **Encouragement of other agency.**—I think under the present system private enterprise is sufficiently encouraged. The contractor instead of employing a temporary upper subordinate is helped by the departmental permanent sub-overseer in lining out foundations, etc., and insisting on works being done properly. He does the work at a lower rate, and it leaves him a better profit as his work is not liable to be condemned after completion, and he has not to employ a temporary hand of doubtful service to him. At the present stage it is not possible to leave any class of public works to any other agency than departmental for reasons already given above. As a first step, however, it would be desirable to restrict contract works to qualified men borne on a register to be maintained by government, under certain conditions of personal inspections. This will be an encouragement to the growth of professional men. After a certain stage, when we have been able to obtain a sufficiently large number of these men, the departmental scrutiny of works may be relaxed and establishment reduced.

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RAI BAHADUR AMAR NATH DAS.

[Continued.]

1,486. (III.) *Changes in organization.*—The changes recommended by the Committee, I find, have not been made known yet.

1,487. (IV.) *Relations with other departments and sub-branches.*—I think the present Public Works Department meets the needs of the other civil departments of the administration. Estimates are prepared, and advice rendered, fairly to time and works and repairs are also executed promptly. In the working of the civil engineering department, unforeseen delays do occur, and cases of inter-departmental friction do arise, but they are as rare as the usual differences between officers in the same branch of service.

The relation between the several sub-divisions of the Public Works Department is satisfactory as far as I know.

1,488. (V.) *Decentralization.*—Except in a few petty items, I do not think further decentralization is necessary.

1,489. (VI.) *Simplification of procedure.*—I do not think the reorganizations of maintenance and execution of civil works as they now stand is unduly restrictive.

1,490. (VII.) *Education.*—I restrict my remarks only to the Sibpur College. The syllabus as now approved I consider is sufficient. The college staff should, however, be strengthened and the college library brought up-to-date. An infusion of professors from educational institutions from England is necessary. There are no demonstrators for the practical works and students are left to pick up as best as they can. On all practical subjects there should be sufficient number of demonstrators. The medical institutions in India, I understand, made a great improvement in this respect during the last 20 years, but as far as I am aware no move has been made in the engineering colleges. I think the Sibpur College has successfully provided fully-qualified engineers and subordinates for local bodies and some private contracting firms.

1,491. (VIII.) *Practical training.*—The practical training is not satisfactory in all cases, as it has been the practice to send out students to certain circles, irrespective of the fact whether there are any construction works of any dimension going on or not. Of late a limited number of students who have passed out is allowed the opportunity of the practical training in the Department. This training should be considered, as before, a year of the college curriculum, and every student should be allowed this opportunity.

The real practical training now begins in practice

when the student is employed in direct and independent charge of a work. This is not afforded at present, and is not possible until there is growth of work done by professional men for private parties.

Generally as regards the lines on which the changes are indicated in paragraph 9 of Government of India letter No. 12-P.W., dated the 2nd June 1916, I would venture to submit that a non-pensionable appointment generally draws a recruit of much lower calibre for the same pay than if it is pensionable. If there is sufficient work it would be desirable to employ permanent officers.

The method indicated leaves the employment of the lower subordinate to the contractor on his own account. My experience is that we have in the Public Works Department trained men on much smaller pay, and it would not be possible for the contractor obtaining a stray job in the Public Works Department to employ and train that class of men.

For repair works it would perhaps be impracticable to employ contractors in the way indicated, i.e., with a view to reduction of establishment charges. For repairs work the estimate will have to be prepared by the local bodies; after the work the measurements will have to be verified. This practically is the work devolving on subordinates in departmental work under the present method, excepting that during progress of work an occasional inspection is necessary to ensure good progress and good work. It is only this latter which may be done away with, but I am afraid that the specifications will have to be elaborate, and additional works, found necessary during progress of work, will suffer for want of timely orders. Out of Calcutta it would not be possible to induce qualified men to take up works at reasonable rates, as the sum total of work is little and the profits expected will not pay any of these men to take up such jobs.

For original works, it is possible to employ contractors who are professional men and of respectability to whom the construction and supervision may be delegated, but rates charged would be very much higher. I know of cases where firms of standing were induced to take up work in the Irrigation Branch on the offer of very much higher rates, and ultimately even with these higher rates there was difficulty in having the work completed in time. Difficulties will arise in case of changes in specification or in the design while the work is in progress. This I mention as it is very frequent that such changes have to be made at the request of the civil officers.

RAI BAHADUR AMAR NATH DAS called and examined.

1,492. (*President.*) The witness stated that he was a Superintending Engineer of seven months' experience, and that he had 20 years' service.

1,493. He dealt mainly with irrigation matters, but had had fourteen months' experience in the Buildings and Roads Branch. He had held charge of the 3rd Calcutta Division for seven months in the year 1907, and the remaining 7 months had been spent as Assistant Engineer in the Chota Nagpur Division.

1,494. In his opinion the employment of large contracting firms for irrigation work would be more expensive than the present system under which the Public Works Department carried out this work, and would lead to an increase of 20 per cent. in the existing rates. He knew of instances where large contractors had been induced to take up irrigation work by an increase of 20 to 30 per cent. in the rates and from this he deduced his conclusion.

1,495. During the seven months he had held charge of the 3rd Calcutta Division, he had not compared the government rates with those demanded by private firms.

1,496. He had partially constructed two buildings when in the 3rd Calcutta Division both of which were in the Medical College grounds. The value of one work done under his supervision was, approximately, Ra. 80,000, and that of the other Ra. 40,000. He did not endeavour to obtain large contractors for these

works, nor did he call for tenders, because in one case the work was in progress when he took over charge and in the other he had orders to execute only a part of the work. In the latter case he had been under the impression that he could not get a sufficiently reliable contractor for the foundations. He had had no experience of large contracting firms in the 3rd Calcutta Division.

1,497. There were not a sufficient number of contractors in Bengal to produce keen competition and he did not think it would induce more contractors to establish themselves if government altered its methods and threw open all its works in Calcutta to tenderers for lump sum contracts. Such a system would inevitably lead to the extirpation of modest contractors from the Indian colleges as the result of competition with larger firms. For the present encouragement of contracting firms, he recommended the system of piece-work contract now in vogue, but thought that eventually, after Indian college contractors had established a reputation and their numbers had increased and private parties employed them, government could certainly withdraw the piece-work system.

1,498. For the construction of works of which he had held charge in Calcutta the majority of the materials used were purchased by government. Government bricks were used and the lime was purchased by government in the first instance, and then supplied to the

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RAI BAHADUR AMAR NATH DAS.

[Continued.]

petty contractor. He thought this was necessary in order to ensure that the quality of the lime used was good enough. Under the present system the Public Works Department was doing work at a low rate and it had to deal with people on whom no implicit trust could be placed, but if the supply of materials from a good firm could be guaranteed a careful examination of such materials would not be necessary.

1,499. His allusion to private engineers and architects being employed on cases relating to the partition of landed property was intended to convey the idea that, although they were largely acting as contractors, their incomes were supplemented by partition work which was not contract work, but merely advisory work in connection with allotments. For this purpose a knowledge of the valuation of buildings and land was necessary, and these engineers were employed by private persons in this connection as expert valuers.

1,500. He recommended a system of registration of contracting engineers, i.e., he would restrict contract work to qualified engineers borne on a register to be maintained by government. He thought that, in the interests of the majority of contractors, it would be better to restrict contracts to qualified men.

1,501. He approved of the syllabus of the Sibpur College, but was of opinion that the college staff should be strengthened. He passed out of the college in 1895 and had, to a certain extent, kept in touch with it ever since. He based this opinion on information he had obtained from later students from whom he had certainly expected better reports in respect to the teaching staff. The information he had received led him to think that the professors and teachers at the college were not up to the mark, and he thought that the staff should be strengthened in quality as also in the number of demonstrators. The class of students turned out by the college, at the present time, was not satisfactory, and was capable of improvement by the employment of a better staff of professors. The theoretical training of the students, including Assistant Engineers and upper subordinates, was sufficiently good for the works at present constructed by the Public Works Department, but he thought an improvement in this training was also desirable. If a better training were given, better work would be obtained from these men. He had been consulted by the principal of the college with regard to the last syllabus and had made a few suggestions to that officer. The syllabus framed was quite good, but he thought that the students turned out of the college were not as good as they would be if the syllabus were fully adhered to.

1,502. An infusion of professors from the educational institutions in England into the staff of the Sibpur College was necessary in order to raise its standard, as professors in India did not keep themselves up-to-date. The college had been rather unfortunate lately in the matter of the recruitment of some of its staff. Temporary engineers who had been brought out to India had not been kept in the Department as such, but had been employed as professors in the college although they had not any experience of teaching and were out of touch with certain subjects. Some of these professors were in charge of the more important subjects of engineering such as applied mechanics, etc. He had had very little experience of the students turned out of the Roorkee College.

1,503. He recommended that the workshop practice under the present curriculum of the Sibpur College should be extended and that the work done outside the college should also be improved. Of late years, only a limited number of students who had passed out of the college were allowed the opportunity of undergoing practical training in the Public Works Department. Some years ago, every student who passed out of the college was allowed to undergo one year's practical training in the Department. This system had been discontinued, and he did not know the reason why of late years only a limited number had been allowed the opportunity. There was not sufficient scope, so far as his experience of irrigation went, for giving practi-

cal training to all passed students. In fact, even with the number receiving such training at present, difficulty was experienced in employing them in any place where really instructive work was being carried out. Of late years he had not been connected with any important original irrigation work which would form a good training ground for passed students.

1,504. He was opposed to a non-pensionable service. By this he meant the employment of purely temporary engineers. If a provident fund were substituted for the present system of pension, he thought it might be accepted and that it would not make much difference, but, from what he knew of the Bengali instincts, they would prefer a pensionable service on lower pay to a provident fund service on a higher rate of pay, and men of the same qualifications would be obtained, he thought, by the adoption of the former method.

1,505. (*Sir Noel Kershaw.*) He rather feared that if small works were given out on contract large contractors would take them up and that this would lead to the elimination of smaller contractors. He was of opinion that large contracting firms in Calcutta would take up a small contract of Rs. 5,000 if they were assured of a profit of 30 to 50 per cent. Under the present system of piece-work, work was being carried out with a margin of profit of 10 to 12 per cent. and he thought that the Indian contractor would accept work for any figure between 12 and 40 per cent. profit, and that large firms, in order to prevent rivalry, would accept something less than 40 per cent. profit.

1,506. (*Mr. Mackenzie.*) In the *mofussil*, in order to ensure that specifications were worked up to, he had a practical system under which the subordinates and the engineer advised the contractor from whom to obtain the particular articles required. The railway receipts and the vouchers from the supply firms were examined in order to ascertain whether the contractor had actually obtained the materials from approved firms. His guarantee of quality was that he himself either examined the materials required for the construction of the work, or obtained them from a firm in whom he placed implicit trust.

1,507. In regard to the registration of contractors, he would admit a contractor who had as his technical adviser a trained engineer, although the contractor himself might not be so trained, as the main *desideratum* was supervision by a duly-qualified man. In his opinion larger contractors would be attracted if allotments were more concentrated instead of dissipated, e.g., instead of three buildings being erected in three years, one was done in one year, but he did not know how far the funds available would permit of this being done, and possibly the department concerned might object. The funds allotted were not sufficient to maintain buildings in first-class condition, particularly in the *mofussil*, and work had to be curtailed according to the funds available. He had had to keep buildings in repair somehow no matter how little money was at his disposal at the time.

1,508. He thought that the amount of work he had to attend to in connection with the distribution of water alone would preclude him from attending to buildings and roads work in addition. The Irrigation Branch in the presidency had charge only of buildings in outlying places which lay on the lines of navigation and irrigation canals, so for the purposes of inspection it did not entail an extra journey, but it would certainly relieve irrigation officers if these few buildings were taken away from them. There was one advantage in the retention of these buildings, however, and that was that they formed a sort of training ground for sub-overseers.

1,509. (*Rai Bahadur Ganga Ram.*) The irrigation officers assessed water rates, but did not collect them.

1,510. When he was in charge of the 3rd Calcutta Division, he obtained his bricks from the Akra brickfield. The rate had varied from Rs. 11 to Rs. 11-8-0 per thousand of late years. This rate represented the price at the site of the kiln. In Calcutta, bricks were supplied at the rate of Rs. 18 to Rs. 22 per thousand, the latter figure being the rate three years ago. The

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RAI BAHADUR AMAR NATH DAS.

[Continued.]

government rate for bricks in Calcutta was Rs. 15-4-0 per thousand of which Rs. 3-12-0 represented the cost of cartage. He did not know the rate at kiln site at Calcutta; this rate varied, and the value of land was very high.

1,511. He thought that large contracting firms in Calcutta would take up work at a profit of 12½ per cent. to start with, in order to exclude the petty contractor. Under the procedure in force in Calcutta for the construction of a work bricks were always supplied by government to contractors, the latter allowing the government rate of bricks to be deducted from their bills.

1,512. The system at the Sibpur College was much the same as that in vogue at Poona. There was only one class and the first man on the list obtained the government appointment. He would split up this class into two sections one for Assistant Engineers and the other for upper subordinates, but he thought there were practical difficulties in the way. Besides, there would not be sufficient scope for those who duly qualified.

1,513. It was his experience in Calcutta that the upper subordinate was of great help to the Executive Engineer. Formerly, that officer had to make all the calculations himself, but on account of the heavy work at the present time it was only possible to carry on by delegating the major portion of such calculations to the upper subordinate.

1,514. The temporary appointment of officers of the Public Works Department to the Sibpur College for a period of three years for the teaching of selected subjects would be a good thing for the students.

1,515. He was not opposed to a provident fund system, and personally would accept such a system, but knowing

the instincts of the Bengali, he thought they would value a pension much more than a provident fund.

1,516. For the weeding-out of bad bargains, he would give government the power of compulsory retirement, and he would also give a man the option of retiring early, but thought that the latter would not be in the best interests of government.

1,517. (*Mr. Cobb.*) There had recently been an enormous amount of work, outside government work, carried out in Calcutta. When people built houses costing about Rs. 50,000 they did not think of employing an architect and engineer, but obtained the services of a modest amateur draughtsman who drew up a plan good enough to pass the municipal office. The municipal bye-laws, which were rather elaborate, laid down that houses should be well built and their height was regulated according to the width of the road, etc., but the municipal authorities did not get an assurance that the houses were well built and that the quality of the materials used was good nor did they want such an assurance. If a large contractor took up the construction of a house costing Rs. 50,000 and charged very reasonable rates, it would result in the extirpation of smaller contractors. He did not know how far large contractors would apply commercial principles in such cases. In the case of the construction of government work, too, large contractors would eventually displace the smaller contractors and dictate higher prices. He could not recollect any instances of this nature which had occurred during the past fifteen years, but he knew of cases, outside government work, where large contracting firms had suddenly cut down their rates to secure particular contracts.

At Calcutta, Friday, 2nd February 1917.

PRESENT:

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

C. S. COBB, Esq., M.V.O.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member:—

The HON'BLE MR. H. H. GREEN, Chief Engineer and Secretary to the Government of Bengal, Buildings and Roads Branch.

D. G. HARRIS, Esq. (*Secretary*).

H. A. CROUCH, Esq., F.R.I.B.A., Consulting Architect to the Government of Bengal.

Written Statement.

1,518. (I.) **Economy and suitability of methods of execution of public works.**—It would be possible to obtain better buildings, if it were practicable for all the more important buildings to be designed and their construction superintended by trained architects, following the custom of other countries where the architect is responsible for design and construction from start to finish, and the building is put under the immediate and continual supervision of an experienced clerk of works directly responsible to the architect for the quality of work and for carrying out his instructions accurately.

1,519. (II.) **Encouragement of other agency.**—Obtaining designs from architects in private practice would cost government much more than the present architectural establishments.

(2.) Obtaining designs and estimates from firms of contractors cannot prove as economical as paying for a design and obtaining competitive tenders for constructing a building. Contractors who are prepared to submit a design must necessarily pay their staff to prepare it, their rates for building must thereby be increased and government would lose the opportunity of getting competitive estimates.

1,520. (III.) **Changes in organization.**—This must depend on (I). When it is possible to adopt (I), except in

cases of special engineering character, there will be no need for the inspection of buildings under the architect's supervision by any of the engineering establishments.

1,521. (IV.) **Relations with other departments and sub-branches.**—Personally, I have always been able to work smoothly with the various sub-divisions of the Buildings and Roads Branch, sanitary, electrical and civil engineering, and have invariably met with assistance and a readiness to adopt any suggestions I have made. A larger architectural establishment is necessary, however, to permit of proper inspection of work in progress. The present form of administration necessitates the Architect to Government being subordinate to the Chief Engineer. This may be expedient at present, but I think the system is wrong and it is desirable, in order to obtain the best results and to recruit men of the best class, for the Architect to Government to be head of a department and solely responsible to government, and that his position, prospects and pension should be in no way inferior to those of an engineer.

1,522. (V.) **Decentralization.**—With the development of architectural control it will be desirable to form architectural circles.

1,523. (VII.) **Education.**—No satisfactory provision is made for teaching architecture. This is most desirable.

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MR. H. A. CROUCH.

[Continued.]

MR. H. A. CROUCH called and examined.

1,524. (*President.*) The witness stated that he was Consulting Architect to the Government of Bengal and had seven-and-a-half years' service. His appointment was a temporary one and non-pensionable. He came out to India on a five years' agreement which had been renewed for a further five years.

1,525. His duties were to design any buildings required by the Government of Bengal and he received instructions direct from the Chief Engineer or Superintending Engineer. There was, he thought, a general order to the effect that buildings above the value of Rs. 50,000 should be designed by him but this figure was not always abided by. Frequently small works of importance had been designed by him, some gates at Government House, for example, which cost Rs. 5,000 only, but which required careful treatment. As a matter of fact all designs of buildings costing Rs. 50,000 or more had to be designed by him, and the local Government could request him to prepare or scrutinize any other designs of buildings. Cases involving the scrutiny only of designs had decreased as he had in the past very often found it necessary to entirely remodel them, with the result that he was now asked to draw them up in the first instance. The designing of buildings costing less than Rs. 50,000, was sometimes left to the discretion of the Superintending Engineer, and apart from the requests made by the local Government for actual designs for buildings other members of the Public Works Department sent designs to him for scrutiny. His duties had been defined in a circular letter which had been sent round to the various Superintending and Executive Engineers in the province. Acting on this circular, Superintending Engineers sent cases direct to him. It was drafted some years ago, but in practice the orders contained therein had not been strictly adhered to; his duties had now increased. His duties were not confined to the designing of buildings in Calcutta, but embraced the important ones required in the *mofussil*.

1,526. He had no executive power in connection with the construction of buildings, even in Calcutta. His duties did not include inspections. These were performed voluntarily in order to ensure that the details of his designs were strictly adhered to. He had met with a ready response from all engineers in carrying out any suggestions which he had found it necessary to make. His inspection of building work in the *mofussil* was very limited. He would have preferred to do more in this connection, but the time at his disposal was insufficient.

1,527. He was not responsible for the structural stability of buildings designed by him, and considered that the Consulting Architect should certainly be held so responsible.

1,528. As Consulting Architect to the Government of Bengal he had no connection whatever with the Government of India, and he was not required by rule or otherwise to submit for their approval any of his designs or plans. As designs of imperial buildings required the sanction of the Government of India as a matter of course, he presumed the design of a custom house would have to be submitted for such sanction. He was required to submit an annual report to the Government of India and that report was published *verbatim* by the Consulting Architect to the Government of India in his annual review. The Consulting Architect to the Government of India did not supervise his work.

1,529. The employment of a local Consulting Architect tended to economy. The figures in the statement he had furnished comparing the cost of his establishment with the fees which would ordinarily be charged by private architects were based on the scale of fees sanctioned by the Royal Institute of British Architects, but he was not aware whether that scale was adopted by private architects in Calcutta. He presumed so, however, and thought that their charges might even be greater. The charge of $\frac{1}{2}$ per cent. included in his comparative statement for sketches excluded the preparation of building designs for which, including full-sized

drawings, $2\frac{1}{2}$ per cent. was charged, this latter was not excessive. This percentage was in accordance with the scale of charges sanctioned by the Royal Institute of British Architects. Once tenders had been accepted, architects were entitled to 3 per cent. and a margin of 2 per cent. for supervision, but as numerous full-sized details were always prepared during supervision, the 2 per cent. allowance for supervision was rather misleading. He considered that $1\frac{1}{2}$ and $\frac{1}{2}$ per cent. would be more representative of the charges for supervision, and the preparation of full-sized details, or possibly $1\frac{1}{2}$ and $\frac{1}{2}$ per cent., respectively.

1,530. If he prepared more than one design for a project, through no fault of his own, he would certainly make an additional charge as was the practice with private architects. For example, if a client did not like the arrangement of some portion of a plan submitted to him and the architect was consequently obliged to re-plan the building and provide different accommodation, the latter would treat this modification as a new design. If an architect had any sense at all he would find out early the requirements of his client before he put too much labour into his design. It had been his experience that administrative heads of departments did not always make up their minds as to what they really required. Consequently he had had occasionally to recast designs two or three times for one project. This was also the experience of private architects, and the remedy lay in securing, in the first instance, full details signed by the officer making the request for a design. He thought the Architect rather safeguarded the interests of government in that when he was asked to prepare a scheme he possibly knew more about it, and went deeper into it, than an engineer who really had not sufficient experience or time for the purpose. As an architect was cognisant of the difficulties to be contended with and the amount of labour which would be required in preparing a design he thought that an architect could reduce the labour that an engineer might incur.

1,531. The charges in his comparative statement included the salaries of his clerks and in fact his entire

STATEMENT I.

<i>Cost of establishment of the Consulting Architect.</i>	Rs.
1910-11.—Cost of establishment	14,968
Approximate value of fees for the projects designed	56,966
1911-12.—Cost of establishment	17,320
Approximate value of fees for the projects designed	54,903
1912-13.—Cost of establishment	21,599
Approximate value of fees for the projects designed	61,768
1913-14.—Cost of establishment	28,926
Approximate value of fees for the projects designed	53,347
1914-15.—Cost of establishment	35,657
Approximate value of fees for the projects designed	64,320
1915-16.—Cost of establishment	37,062
Approximate value of fees for the projects designed	79,164

STATEMENT II.

Indent for stationery articles of the Consulting Architect to the Government of Bengal.

	Rs.	A.	P.
1911-12	342	11	10
1912-13	383	0	1
1913-14	400	10	6
1914-15	373	8	7
1915-16	442	7	2

Imprest Account (office expenditure) (including rent of telephone, registration for special delivery of telegrams, drawing instruments, subscriptions for foreign periodicals, liveries for the peons, gharry hire, office furniture, etc. etc.)

	Rs.	A.	P.
1912-13	347	5	0
1913-14	723	2	0
1914-15	1,536	3	3
1915-16	487	8	3

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MR. H. A. CROUCH.

[Continued.]

establishment but did not include office rent. The other statement he had submitted included all the expenses of his department, with the exception of travelling expenses which, in addition to postage, would, in the ordinary course of private practice, be recoverable from the client. These charges were small and with the exception of office rent, the statement afforded a reliable comparison.

1,532. There were five or six qualified private architects in Calcutta who possessed English qualifications. Two of these, however, were employed by building firms and did not practise independently, and one by the Calcutta Corporation. He was disinclined, for obvious reasons, to give an opinion on the desirability of a proposal that all designs for government buildings required in Calcutta should be thrown open to competition instead of being executed by the Government Architect. He had had some experience of, and had examined, architectural work constructed by private enterprise in Calcutta. It was a trifle cheaper, but not so good as that constructed by the Public Works Department. He was under the impression that an inquiry in this connection had been instituted in Calcutta some years ago by the then Chief Engineer, when it had been proved conclusively that the Public Works Department rates were not higher than those of private contractors, but could not offer a personal opinion in the matter as he possessed no executive functions.

1,533. When he had stated in his written evidence, in connection with the submission of designs by contractors, that their rates for buildings must thereby be increased and government would lose the opportunity of getting competitive estimates, he was referring to a project being handed over to a building firm to both design and build as had been done in the past when a firm had been given *carte blanche* to design and construct a building as quickly as possible. This would not apply in the case of a system under which there was a competition for designs only, but it would if tenders were submitted with the designs.

1,534. If government were to throw open its major building projects in Calcutta to competition it might induce the establishment of architects in practice, but the building field was not, in his opinion, large enough to encourage good men. The construction of large government buildings in Calcutta costing Rs. 3,00,000 or Rs. 4,00,000 did not amount to more than one or two annually in normal times, and this number was not sufficient to induce men to set up in Calcutta. There might at present be a sufficient number of architects to make competition possible, but, if so, they had sprung up only within the last year or so.

1,535. He did not see any objection to the giving of lump sum contracts for building works in Calcutta based on a schedule of rates and he would advise the adoption of that system, *viz.*, one contractor being responsible for all trades. This system was followed in the south of England.

1,536. Not having been given sufficient executive control, he was not in a position to say whether it was really necessary for government to supply its own materials for the construction of building works in Calcutta. He thought that the government brickfield reduced the price of bricks in Calcutta. He was also unable to say definitely whether the private supply of bricks was inadequate, and the stocks insufficient, for building work in Calcutta.

1,537. He thought there would be no difficulty in creating a separate Architectural Division in Calcutta under an Architect who would be responsible for the construction as well as the design of buildings, provided the Architect was allowed to exercise supervision over the divisional establishment. Conditions in Calcutta differed from those in Bombay owing to the area of the former being greater than that of the latter. Normally there were three Executive Engineers in Calcutta entrusted with building work. These were fully occupied, and he understood that there was only one Executive Engineer in Bombay who did construction work. Two out of the three Executive Engineers in Calcutta were also largely

employed on road work. He recommended the introduction in Calcutta of the system followed in Bombay, under which the Architect was responsible for both the construction and design of his buildings, provided the Architect were given the necessary staff, and considered that the system, while costing government more in the shape of increased establishment by reason of the recruitment of a larger number of Architects, would lead to the erection of a better and more suitable class of buildings. If his recommendation were given effect to, he advised that a civil engineer should be attached to the office of the Architect for the first two years, as an Architect recruited from England would have no experience of local conditions. After that period there would be no need for the civil engineer except in a case of special engineering character. The system he had advocated would not be feasible in the *mofussil* for some time. Outside Calcutta there was no building work at present of sufficient importance to justify the employment of an Architect with executive functions in preference to a civil engineer. Conditions were very different in the *mofussil*, and there were no contractors there who were capable of carrying out efficiently the construction of buildings. The Executive Engineer had to act as builder, to a certain extent, and make arrangements for the contractors. He had also to indent on Calcutta for the various materials, but it might be possible to induce a contractor to undertake the wood-work of a building. Hence he thought that the *mofussil* was not suitable for an Architect with executive control at present.

1,538. He had two Assistant Architects, one of whom had been on military duty for the past two years. His staff consisted of one Assistant Architect while a second Assistant Architect had been recruited for work in connection with the Dacca University. The remainder of his establishment consisted of draughtsmen and tracers.

1,539. He recommended the engagement of a larger staff in order to enable him to devote more time to inspection work. He considered it very desirable that buildings constructed in the *mofussil* by the ordinary Executive Engineer should be inspected by the Architect.

1,540. He thought that the best method for the recruitment of Government Architects was by advertisement through the President of the Royal Institute of British Architects in England. The field for the recruitment of Architects in India itself was insufficient at present. He was doubtful as to whether government should recruit its Architects for a period of years on a temporary basis, or whether they should be recruited as permanent officers. The question was a difficult one to answer, but he thought that the prospects of Architects should be equal to those of engineers. They should be made permanent after serving for a period of not more than three years. He felt personally that a man on probation was more or less on his metal, and worked best so long as he was kept on probation, in order to emphasize his usefulness, and he thought that generally there was too much permanency in government service. Having carefully weighed these considerations he thought that, while in the interests of the men themselves permanency was desirable, it was undesirable from an architectural standpoint.

1,541. The position, prospects and pension of the Consulting Architect to Government should be in no way inferior to those of the engineer as was the case at present. Even if government could secure competent Architects under the present system, the higher rate of pay was justified and would be an inducement to young men to come out and look upon India as a field for employment. It might of course be necessary to give *special* Architects even more pay than civil engineers and as concrete cases he cited those of the Architects who were designing the New Capital at Delhi.

1,542. There was no school of architecture in Bengal, but there was a course of architectural drawing given at the School of Arts in Calcutta. That school turned out only draughtsmen and these men were of very little use compared with those turned out from Sibpur. There was no specialization in architecture in the Sibpur College. During the third year in the B.E. course the men only

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devoted five hours a week for six months to drawing, designing and attending lectures on architecture; similarly, during the fourth year, the men spent one hour a week on the above subjects for 6 months. He was of opinion that it was very desirable that some arrangements should be made for instruction in architecture, and that additional lectures on this subject should be given at the Sibpur College. But, as architecture was so exhaustive a subject, he preferred the institution of a separate school. He suggested that, for the present, this school could be attached to the Sibpur College by virtue of the fact that a more intelligent class of students attended that college, but held that, in principle, such a school should be attached to a school of art, rather than to a civil engineering college.

1,543. He had had experience of the students turned out from the Sibpur College. The men who had passed the upper subordinate course who came to him were generally employed as draughtsmen. He considered that they were well trained in theory, one who was at present in his employment had been very well trained indeed. From an engineering point of view he thought that these men provided useful material, but they were not architects in any sense of the word; they knew nothing about architecture. There were no arrangements in Calcutta for the practical training of students in architecture and he had not heard of any private firms who took a premium from a student for such practical training.

1,544. He had not had any students under training in his office, but had an unpaid apprentice draughtsman who was decidedly promising, and he was of the opinion that this apprentice would eventually develop into a useful draughtsman. Given more room, and a sufficient staff, he thought it would be possible for him to take in a limited number of pupils for practical training in architecture, and he presumed that private firms in Calcutta would be agreeable to do the same. If a student from Roorkee, who had finished his engineering course, wanted to specialize in architecture, it would certainly be possible for the witness to take him into his office and give him the necessary instruction if he were given sufficient office room. In his present office, however, he had not room for the training of even one student, and if more room was available he did not think he personally would have time adequately to train more than one student at a time. If the proposed School of Architecture were established in Bengal it would be impossible to give all the students of the school practical training in his office, though it might be possible to institute morning classes for such training.

1,545. The reason for the formation of a separate school of architecture was that the country was rapidly developing and would need more architects in the near future. When he had stated that 'there were not enough architects' he was speaking of the present. If Indian architects were trained, the public demand for their services would increase, in fact such demand was on the increase at present. Two or three Indian engineers with whom he was acquainted had been trying to study architecture lately. They had been touring about the country, and had called at his office, and picked up bits of information whenever they could. They knew very little about architecture, but made a praiseworthy attempt to learn what they could. If a separate school of architecture were opened in Bengal he was not certain that there would be sufficient openings for the students to begin with, but they were bound to arise in time. One good school in India was all that was required at present.

1,546. (Mr. Cobb.) The amount of private work in Calcutta far exceeded the government work, which was only a drop in the ocean compared with the former. He could not give the percentage of government to private work, but guessed that it was roughly 15 per cent. or possibly more. On reconsideration he agreed that there was justification for the immediate establishment of a separate school of architecture in view of the fact that there would possibly be sufficient work for the

passed students of such a school. The need for its creation would make itself felt more and more in the future.

1,547. His schemes were open to the criticism of the Chief Engineer, but the Chief Engineer seldom criticised them. Such schemes, as a rule, came to him in the first instance through the Chief Engineer, but sometimes direct from the heads of departments. In cases of the preparation of a building scheme the Chief Engineer indicated the accommodation required and left the architectural treatment entirely to him. If he had to design a building, the cost of which was high because of its embellishment, the Chief Engineer could criticise it if he thought it unduly extravagant, but the witness' own responsibility in the matter would prevent the submission of plans open to criticism of this nature. He was not only the accredited architect, but acted as an adviser to government on building projects, and he would be failing in his duty if he prepared a design which put government to unnecessary expense. It was true that an architect sometimes ran up the cost of a building to obtain the effects he desired.

1,548. (Rai Bahadur Ganga Ram.) He was not responsible for the sections of steel-work in a building, nor was he responsible for the foundations. He did not specify the width of foundations, this being left to the engineer.

1,549. He was entitled to take up private practice, but he could do so only with the previous sanction of government. He would certainly not accept lower pay if the necessity for obtaining such sanction was removed and he was given a free hand to take up private work. He had found it impossible to undertake much private work in Calcutta, owing to the enormous amount of government work with which he had to deal. If the restriction regarding private work were withdrawn, and the Government Architect had less government work and consequently more time at his disposal, he thought the post of Consulting Architect might attract good men on lower pay, but he could not see how any Government Architect would have much time for private practice if he performed his duties conscientiously. Some men, however, objected to being tied down solely to government work.

1,550. Most Indian engineers called themselves architects, and he did not know how many Indian firms who called themselves architects there were in Calcutta. Anyone could call himself an architect in Calcutta, but he imagined that the corporation insisted on a license being obtained before a man practised as such.

1,551. If any additional items were rendered necessary during the construction of a work their cost, including steel-work, would be decided on the schedule of rates.

1,552. At present draughtsmen turned out from the School of Art were paid salaries of about Rs. 30 a month, rising to Rs. 100 and Rs. 150. The head draughtsman in his office was a European, but he possessed no English qualifications. He was a man who had been in several Government Architects, and other offices. His pay was Rs. 270 a month, and he was a very useful man and deserved a higher remuneration.

1,553. When he was called upon to prepare a sketch he generally put up an approximate estimate preparatory to the elaboration of the design.

1,554. If government asked a firm of contractors for a design and subsequently approved it, the firm would undoubtedly expect government to give them the particular work. When he stated in his written memorandum that 'government would lose the opportunity of getting competitive estimates' he meant "competitive tenders." If government wanted to obtain designs from architects, government should throw the designs open to competition and offer a prize, or else pay each man for his trouble and expense. Occasionally contractors submitted tenders without any guarantee that the lowest tender would be accepted, but it was rather a breach of faith not to give work to the lowest man unless there was some special reason for it.

1,555. (Sir Noel Kershaw.) He thought he should be allowed to take up private work in the interests of architecture, but his remark did not apply to designs for

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private buildings generally as it was undesirable that the services of the Government Architect should generally be available for such work. There was always the danger that the taking up of private work would lead to neglect of the Government Architect's more legitimate duties as that officer was in receipt of a fixed salary. On the other hand, it was desirable that the Government Architect should be allowed to assess architectural competitions and act in a consulting capacity.

1,556. If the Public Works Department constructed a building the cost of which was Rs. 4 lakhs it would employ a sub-overseer, an overseer, a sub-divisional officer and an Executive Engineer on its actual supervision, i.e., two men would spend their whole time, and two men would spend part of their time, on the supervision. In other words, he would engage one overseer less and would employ a clerk of works. The great difficulty lay in finding an efficient clerk of works. Men of the class obtainable in England were not available in India.

1,557. He had advocated improvement in the architectural appearance of buildings; this frequently involved an increase in their cost and it was a question how far one was justified in increased expenditure. It was always a question whether, after one had got to a certain standard of proportion, one was justified in elaborating the design of government buildings.

1,558. (*Rai Bahadur Ganga Ram.*) He thought it would be possible to retain an architect on a fixed salary plus a certain percentage for actual work done, as was the practice in the legal profession, but was of the opinion that such an arrangement would prove more expensive to government, and undesirable in other ways.

1,559. (*Mr. Cobb.*) He considered that a trained architect should be consulted in the majority of cases, not only to ensure good architectural treatment but also for the sake of the occupants of the buildings and in the interests of government.

1,560. Up to the present there had been no real opening in India for the training of architects on a large scale, but the witness thought that teaching engineer students a smattering of architecture, which was all they would get by a course sandwiched in with their engineering course, would be better than nothing. It would be a good thing to have engineers who had studied the rudiments of architecture.

1,561. (*Mr. Green.*) He desired to have the Executive Engineer under his direct control, rather than under that of the Superintending Engineer, though such an arrangement would take up a great deal of his time.

1,562. A building erected by an Executive Engineer from the design of the Architect was satisfactory from the engineer's point of view, but the witness thought it only natural that when an engineer carried out an Architect's designs, the former could not have so real an interest in the building as the Architect.

1,563. At present, the construction of buildings was not good; plastering work, particularly, was very inferior in India and this was largely the fault of poor supervision by the subordinate establishment. Executive

Engineers did not evince sufficient keenness in making the *mistri* do his work in the right way. In his opinion, the former should sometimes labour with his hands to show how work should be done. He had done it himself.

1,564. He had felt the need of additional establishment, particularly for inspection work.

1,565. (*President.*) He considered that the present establishment employed on the construction of buildings in Calcutta should be abolished in favour of an architectural establishment and that the present Executive Engineers should be gradually replaced by Assistant Architects. The subordinates would be employed under his Assistant Architects who in turn would be directly subordinate to him. It was necessary to retain Executive Engineers at present, because they had experience of the country, but as soon as the Architect obtained the men he wanted it would lead to a higher standard of building in Calcutta.

1,566. (*Mr. Green.*) He thought it would suffice if engineers received a preliminary training in architecture before they came out to India, i.e., if an architectural training of three or four years was included in their college course.

1,567. (*Rai Bahadur Ganga Ram.*) Of the two divisions and two Executive Engineers in Bombay, one was an Architectural division under an Architect. The other division was in charge of an engineer who was not a trained architect, but he carried out, satisfactorily, the Architect's instructions. If, out of the three Executive Engineers' divisions in Calcutta, one was placed under the Architect it would perhaps meet the case, but he would then require the services of two or three engineers. One would not be sufficient to attend to all the work in Calcutta which was much greater than that in Bombay.

1,568. (*President.*) The Calcutta Municipality employed an architect of their own. The Calcutta Port Trust had no architect, so far as he was aware, but they did not have much building work. He presumed that whatever they required was done by private architects in Calcutta. The Calcutta Improvement Trust had no architect, but employed an engineer for their building work.

1,569. The only case in which he, as Government Architect, had been called upon to prepare designs for public bodies had been in connection with the Calcutta University. He had designed several hostels for the University.

1,570. (*Mr. Green.*) He had designed a number of projects for the *mofussil* in Dacca, besides the Dacca University, some in Darjeeling, in Chittagong, Bankura, Khulna, Midnapore, Pabna, Krishnagar, Barisal, Serampore, etc., all costing considerably more than Rs. 50,000. There were not many projects in the *mofussil* costing more than Rs. 50,000, and hence a special Architect was really not required for *mofussil* work at present, but the necessity for such an officer would arise in time. He, as Consulting Architect, could attend to the requirements of the *mofussil* at present, but it was desirable to engage more architects to enable him to go on inspection duty more frequently.

A. K. TAYLOR, ESQ., A.M.I.C.E., M.I.E.E., A.C.G.L.I., Executive Engineer, Electrical Division, Calcutta.

Written Statement.

1,571. (I) Economy and suitability of methods of execution of public works, and (II) Encouragement of other agency.—The executive Electrical Division was originally formed to carry out the maintenance of all electrical works, and to specify and supervise all original electrical works under the Public Works Department in Calcutta. Previously, this was done on the request of the civil officer concerned, without any specification or expert supervision: consequently, the cost was excessive and the work inferior. When repairs were necessary the nearest firm was asked to send a *mistri*, and heavy maintenance bills were incurred.

(2). The present method of carrying out original works in this division is as follows:—

Plans, specifications and schedules of quantities are prepared, competitive tenders are called for, the contract

is awarded to one or more contractors of good standing, orders are given to start the work, it is inspected on behalf of government during progress, and, finally, it is measured up, bills are made out and checked against the rates tendered, and paid.

(3). I presume it is not suggested to do away with the present system of calling for tenders, but merely to compel the contractor to do more—

- (a) inspecting;
- (b) checking of details and quantities.

I do not, however, consider that further responsibility in this direction can be given to contractors.

(4). As regards maintenance, if this work were entrusted to contractors—

- (i) since contingencies will in every case be a large and variable figure, every contractor will cover himself in his tender;

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- (ii) there will be difficulty in checking any materials used ;
- (iii) men will always have to be present to attend to any repairs immediately, and some must live on the premises ;]
- (iv) finally, no contractor is going to advise government to be economical.
- (5). I understand that some forty years ago the East Indian Railway decided to maintain their permanent-way by contract, but that they eventually found it better and more economical to do it themselves.

1,572. (IV.) Relations with other departments and sub-branches and (V) Decentralization.—As regards this division, the conditions are most unsatisfactory—

- (1). It is under the control of the Superintending Engineer, Presidency Circle, who does not ordinarily pretend to any electrical knowledge.
- (2). Though the officer-in-charge is an Executive Engineer, he is not allowed to draw the maximum pay of a similar appointment in the Buildings Branch.
- (3). He is, of course, subject to all the restrictions of the Public Works Code, *e.g.*, certain funds are budgetted for annually for maintenance and repairs of electrical work, but he may not use such funds to rewire a building, however dangerous its condition may be, without the sanction of the Superintending Engineer. Again, in calling for tenders for large works, he is compelled to take earnest money and security deposits. There are only a few electrical contractors in this country who are capable of working to a strict specification ; all of them are firms of good standing ; only such firms are asked to tender ; therefore, it is quite superfluous to insist on such security being taken in every case, and this only increases the office work and puts up contractors' rates. These matters could very well be left to the discretion of the officer-in-charge.

- (4). It was decided by the Government of India (*vide** Bengal Government letter No. 1957-E. of the 4th—17th August 1914) "that electrical subordinates are not to be regarded as in the same position as Public Works Department officers", that is to say, the officers in the Electrical Division have not equal qualifications with those of the Buildings Branch; the result is seen below :—

*Copy of letter No. 1957-E., dated the 4th—17th August 1914, from the Secretary to the Government of Bengal, Public Works Department, to the Superintending Engineer, Presidency Circle.

I am directed to acknowledge the receipt of your letter No. 3343, dated the 8th June 1914, recommending the grant of the following allowances to the upper subordinates of the Electrical Division :—

- (1). Presidency allowance, presidency house-ent and sub-divisional allowances to Messrs. W. L. Stevenson, W. J. Trusler and H. V. Marchant ; and
- (2). Presidency house-rent and sub-divisional allowances to Babu Satyendra Nath Sen.

2. As regards presidency allowances and presidency house-rent, I am to point out that the pay of the upper subordinates of the Electrical Division, which is a special department employed in Calcutta only, was recently fixed with special reference to their work at the presidency, where it was known from the beginning was the only place they could be employed. There is, therefore, no ground whatever to grant special allowances to compensate them for being employed in Calcutta.

3. As regards sub-divisional allowances, I am to say that as the Government of India have decided that electrical subordinates are not to be regarded as in the same position as Public Works Department officers, the Public Works Department Code does not apply to them. They cannot, therefore, be given sub-divisional allowance on the strength of the Public Works Department Code ruling, and for the reasons given above there are no grounds for sanctioning any allowances outside the Code.

The upper subordinates concerned should be informed accordingly.

Designation.	Pay.	House rent.	Presidency allowance.	Sub-divisional allowance.	Travelling allowance.	Total.	Number of buildings under his charge.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Assistant Engineer (Buildings).	250—25—475	30	65	30	30	405—25—630	25—30
Assistant Engineer (Electrical).	350—30—500	..	..	..	30	350—30—530	Assistant to Executive Engineer in head office.
Sub-Engineer, 1st grade (Buildings).	400	20	50	30	30	530	20—25
Sub-Engineer, 2nd grade (Buildings).	300	20	50	30	30	430	20—25
Sub-Engineer, 3rd grade (Buildings).	250	20	50	30	30	380	20—25
Sub-Engineer (Electrical)	250—10—350	..	..	..	30	280—10—380	115
Supervisor, 1st grade (Buildings).	200	10	50	30	30	320	20—25
Supervisor, 1st grade (Electrical).	200	..	..	..	30	230	100
Supervisor 2nd grade (Buildings).	150	10	50	30	30	270	20—25
Supervisor, 2nd grade (Electrical).	150	..	..	..	30	180	75

Now (1), in a sub-division of the Electrical Branch the number of buildings is three or four times as great as in one controlled by the Buildings Branch ;

(2) in the Buildings Branch an extra overseer is granted for large original works ;

(3) the electrical officers are compelled to live in the presidency, admittedly more expensive than the *mofussil* ;

(4) all officers in charge of a sub-division in the Buildings Branch draw sub-divisional allowance.

Yet for all this—

- (1) the maximum pay of a sub-engineer in the Electrical Branch is less than that of a 1st grade sub-engineer in the Buildings Branch ;

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- (2) in the Electrical Branch no extra overseer is granted for any original work;
- (3) the electrical staff cannot draw presidency allowance or even house-rent;
- (4) the electrical sub-engineer, and the two supervisors, get no sub-divisional allowance, though each is in charge of a sub-division.

One cannot help wondering whether this decision was not reached from the hypothesis that an electrical engineer is a man who comes round to replace an old lamp or mend a fan when summoned—in fact a *mistri*. One thinks of the high government official who, when told that the cinchona plantations of a presidency required ‘a chemist’ to supervise and direct operations, replied, ‘Yes, I suppose a babu on Rs. 50 a month from Messrs. So and so’ (naming the local druggists).

(2). It seems to me that a juster method of comparing the qualifications of these two branches would be to consider how much training is required for each:—

(a) *Buildings Branch*.—A would-be overseer takes a four years’ course at, say, Sibpur (or some similar place); this is supplemented by one year’s practical training either in, or outside, the college.

(b) *Electrical Branch*.—A candidate until recently took a course of the same length as (a), specializing in electrical and mechanical work. [This course has lately been reduced from 4 to 3½ years, and further specialized; but I now hear that the course for the Buildings Branch (a) is to be likewise reduced; thus the two courses will again be of the same length.]

A smaller number of students attend the electrical and mechanical course, and are thus able to secure more individual attention from their teachers. Thus, at the outset of their careers the candidates for (a) and (b) may be assumed to possess equal qualifications, but the electrical student has not the financial prospects, and all that they imply of the civil student, and this, though his work demands no less knowledge, skill and administrative capacity; he is thus penalized for being unwise enough to study electrical engineering. The consequence might easily have been predicted: men of good social standing, a matter of far greater importance in India than is generally recognized, will not be induced to join this department.

(3). It is unreasonable to expect that, given such circumstances, the government is going to get the best results. It is both fallacious and beside the point to compare (as is habitually done) the skill necessary to supervise work in either branch on the single basis of capital cost, the number of cubic feet of masonry, etc.

(4). I would recommend that the Electrical Division be made equal in status to a circle in the Buildings Branch

under the Chief Engineer. The result of this would be that all executive electrical work in the Public Works Department would be brought under one officer. This will produce uniformity and economy: the Electrical Division has an estimating and drawing staff, with workshop and stores, etc.; it will get rid of much of the cumbersome procedure now necessary, and thus will diminish the annoying delays which too often occur.

(5). At present there is no regular expert control of electrical works outside Calcutta, except that of a local supervisor under the Buildings Branch. Only occasionally is a question referred for decision by the Chief Engineer to the Electric Inspector, Bengal. But the latter is not an executive officer, and, consequently, has no staff (except one man in charge of the Bengal laboratory), so that the work outside the Presidency Circle is largely left to take care of itself.

1,573. (VI.) *Simplification of procedure*.—The Public Works Code is, I consider, unduly restrictive as regards electrical work—probably because it was framed to deal with buildings and not mechanical and electrical engineering works. These restrictions, of course, depend to some extent on their interpretation by the Accountant-General, Bengal, who, of course, is not an engineer, e.g., the conditions governing the local purchase of European stores appear to be unnecessary. The present limitations are wasteful and cause delay. If reliable firms knew that government orders would be placed with them, lower rates would be obtainable than are possible at present: these will, in all probability, be at least as low as those obtained by the present method of home indent. All responsible firms will guarantee their materials, nor need any which are damaged or below specification ever be accepted. If facilities for local purchase had existed before 1914 much of the exasperating delay in obtaining machinery of all kinds in this country on the outbreak of war would never have occurred. It is clearly to the public advantage that the government should encourage British engineering firms of good standing to establish themselves in the country; and the engineers of these firms will have a better knowledge of local conditions and requirements than any official in England.

1,574. (VII.) *Education and (VIII.) Practical training*.—I consider that the system of education in government engineering colleges, as carried out in the Civil Engineering College, Sibpur (the only one I know), meets generally the needs of government and private enterprise. It is a pity that after providing such education, the prospects open to mechanical and electrical students in government service are so poor.

MR. A. K. TAYLOR called and examined.

1,575. (*President*.) The witness stated that he was the Executive Engineer in charge of the Electrical Division, Calcutta, and that he had had twelve years’ service under government. He possessed special qualifications as an electrical engineer, and had received a practical training of three years at the Central Technical College, South Kensington, subsequent to which he had served for about two years as an apprentice with Messrs. Elliott Brothers in St. Martin’s Lane, and the Epstein Accumulator Co. in North Staffordshire. He had been recruited in England and came out originally on a contract for three years, which had been renewed from time to time. The post he held was a permanent non-pensionable one.

1,576. An Assistant Engineer had been sanctioned for him, but the appointment was held in abeyance on account of the war. The appointment of Government Electric Inspector was altogether separate and the officer holding it was in no way subordinate to the Executive Engineer of the Electrical Division.

1,577. His work was confined to Calcutta and to the buildings comprised in the Presidency Circle, and thus lay within a restricted area. There was no very definite procedure for the construction of electrical installations outside Calcutta, but, so far as he was aware, the

Government Electric Inspector was consulted in cases of differences of opinion and allied matters. The present salary of the Electric Inspector was about Rs. 1,200 a month. His own salary was Rs. 1,000 per mensem and could not be increased as the pay of the post was Rs. 800 rising to Rs. 1,000. Though he and the Government Electric Inspector held separate appointments they acted for each other on occasions. His own duties were mainly of a supervisory character. The division of which he held charge had been created chiefly for the maintenance of electrical installations in government buildings in the Presidency Circle. A large number of these had been put up by civil officers themselves. He was not in charge of any power works, as the energy was supplied by private companies. He did not exercise directly any statutory powers under the Indian Electricity Act, neither did he conduct any inspections under that Act. All he did was to see that new installations complied with the regulations under the Act. In the event of any dispute, this was referred to the Government Electric Inspector who was the administrative officer, and in whom all the statutory powers under the Act, even in Calcutta, were vested.

1,578. The witness only carried out repair work as he had no staff for original work. He designed and super-

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vised original works, however, which were carried out through the agency of contractors. Original works of any magnitude were invariably executed by contractors after tenders had been called for and only very small works, e.g., those costing about Rs. 200 were done departmentally.

1,579. There were, approximately, half a dozen reliable firms in Calcutta capable of carrying out electrical work. He had not effected a comparison between the quality of the work done by contractors and through departmental agency, as only repair work was executed by the Department. A special staff was employed to attend to repair work, and whenever there was anything beyond their scope outside agency had been invoked.

1,580. With reference to the statement in his written memorandum that the system of entrusting the entire maintenance work to private firms had been tried and failed, he explained that the remark did not apply to electrical work in his division. The statement had reference to a case in which a railway handed over its permanent-way for maintenance work to a contractor, and had been brought forward to show that the system of entrusting maintenance work to private enterprise without expert supervision had already been partially tried and had resulted in failure. Besides the cost of work in such cases was excessive and the workmanship inferior.

1,581. The Superintending Engineer exercised a disciplinary control over him and such control was practically confined to questions connected with the allotment of funds. In addition, he submitted certain estimates to the Superintending Engineer who, if the amounts were beyond his powers, forwarded them to government. His work was occasionally inspected by the Superintending Engineer.

1,582. The provisions of the Public Works Department Code were unsuitable for electrical work as they had not been framed for the requirements of such work. One of the drawbacks, from an electrical point of view, though not a very important one, was that contractors were required to furnish security. Reliable firms objected to it, but they did not go so far as to refuse to tender on that account. Executive Engineers, in his opinion, should be allowed to use their discretion in the matter and in the event of such discretion being exercised unwisely the Executive Engineer concerned should be held personally responsible. For his own part, he knew the Calcutta firms sufficiently well to judge their capabilities. At present, security was taken indiscriminately. (Mr. Green here explained that though the codified rules on the subject admitted of no discrimination their provisions were not always insisted on.)

1,583. In advocating that service in the Electrical Branch should be on the same footing as in the Public Works Department, he was referring generally to the status of the electrical service and not particularly to pensions.

1,584. He considered that the introduction of a provident fund would be more satisfactory than the grant of pensions, that the existing rates of pay in the branch were unsatisfactory and that they should be assimilated, as far as possible, to those given to other Public Works officers, and that all officers whether attached to the Public Works Department proper or to the Electrical Branch should be brought on to one cadre. He also thought that the head of the Electrical Department should rank as a Superintending Engineer, and be given identical emoluments.

1,585. The Electric Inspector had been acting as, and was to all intents and purposes, Electrical Engineer to the local Government, and was to that extent an executive officer. His post was virtually only an administrative one, as its holder administered the Indian Electricity Act. In the circumstances, he considered that the work which the Electric Inspector performed in his capacity of Electrical Engineer should be handed over to the Electrical Division which had a qualified staff, and that such an arrangement would result in economy and concentration of work. This did not mean that work under the Indian Electricity Act itself should be

transferred to his division but that all work other than that coming within the Act should be made over.

1,586. All the electrical work in Calcutta, but not the whole work in the presidency, was under the witness. He considered, however, that it would be an improvement if an electrical circle were formed to embrace the whole of the province. In justification of the appointment of a Superintending Engineer for the Electrical Branch he stated that the aggregate capital value of the electrical installations in Calcutta amounted to about Rs. 18,00,000. He had no information regarding the total cost of the installations outside Calcutta, but admitted that the figures could not be compared at present with the expenditure in the Buildings and Roads Branch. His proposal would secure uniformity of procedure, and might even result in savings owing to the work being better executed. On further interrogation, he modified his original proposal regarding the status of the head of the Electrical Department to the extent that the local Electrical Engineer should have the opportunity of rising ultimately to the post of Superintending Engineer.

1,587. He had been recruited from England, but did not consider that home was necessarily the best field for the recruitment of electrical engineers. He was quite satisfied with the supervisors and Assistant Engineers who passed out from the Sibpur College.

1,588. In explanation of his complaint regarding the supply of European stores, he stated that, when he was first appointed as Electric Inspector, he indented for a particular class of apparatus, but the Stores Department objected to its supply and substituted one of another make; to this he naturally objected. On the general question regarding the suitability of the Stores Rules he stated that he could obtain certain electrical stores from the firms with whom he placed contracts. For maintenance work, for example, he was permitted to purchase small fittings, bulbs, etc., but there were occasions when special apparatus was required which could not be purchased locally under the rules. The rules also prohibited the purchase of plant above a certain size for the generation of power, other than through the Director General of Stores, and he did not think this restriction was necessary. Broadly speaking, he was not, however, particularly hampered in the purchase of stores.

1,589. In the Sibpur College, there was a special course for electrical engineering combined with mechanical engineering. From his experience of passed students of the college he was satisfied that they were very good, but he considered that their standard of usefulness could be improved by the introduction in the college course of more practical training. He thought that the theoretical training of the students was adequate. He occasionally took students for practical training but they were disinclined to serve without pay as the posts in the Department to which they could aspire were not sufficiently well-paid to be attractive. Some of these students had joined private firms and others had opened businesses of their own, while one of them had taken up work wholly unconnected with engineering.

1,590. For the execution of repair work he had a staff of electrical foremen and wiremen. These men had no theoretical knowledge, but possessed fairly good practical experience. Hence they could perform efficient work under qualified supervision.

1,591. He was not aware what the Sibpur College did in the matter of training men of this class, but the Bengal Technical Institute did something in that direction. The foremen and wiremen employed on his staff had practically received their schooling in the Department.

1,592. There was no system of licensing in force, and any firm could conduct electrical engineering work without obtaining a license. Similarly there was no licensing system for foremen and wiremen.

1,593. The work done by Calcutta firms was, on the whole, satisfactory.

1,594. (Sir Noel Kershaw.) He did not mean to suggest the abolition of either of the posts of Electric Inspector and Electrical Engineer, in his scheme for the concen-

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tration of work. The Electric Inspector was appointed solely to administer the Indian Electricity Act, and incidentally had charge of the Bengal testing laboratory. As there was no Electrical Engineer to the Government of Bengal, all electrical work outside Calcutta had to be referred to the Electric Inspector, who sometimes had to place contracts and prepare schemes, and all he had suggested was that work of this description should be transferred to him.

1,595. He had held, originally, the post of Electric Inspector. He had then himself suggested the formation of the Electrical Division owing to the expanding requirements. He did not agree that there would be no saving by the readjustment of duties proposed, and considered that, even if it led to no saving in actual expenditure, it would result in greater efficiency. His annual expenditure on establishment was about Rs. 1,00,000 a year.

1,596. There was no difficulty in Calcutta in persuading firms to undertake electrical work, and the existence of a comparatively large number of electrical firms as compared with the number of firms undertaking building work might, to some extent, account for the fact that the Electrical Branch had, from its inception, been in the habit of giving out large contracts instead of executing work departmentally or by petty-contract.

1,597. (*Mr. Mackenzie.*) He experienced practically no difficulty in obtaining electrical stores, but remarked that he should be authorized to purchase certain articles direct from England, as was now done by the Medical Department. He obtained most of his apparatus from European firms in Calcutta, but the majority of the articles were not of indigenous manufacture. He believed that the power he desired would save delay in urgent cases.

1,598. (*Rai Bahadur Ganqa Ram.*) His services could be terminated by six months' notice on either side. He was not, therefore, literally speaking in permanent service, though his appointment for all practical purposes could be regarded as a permanent non-pensionable one.

1,599. He presumed the Electric Inspector to the Government of Bengal carried out the duties of Electrical Adviser to Government in addition to his other duties, as there was no specially sanctioned appointment of Electrical Adviser. His work was not supervised by the Electric Inspector, but cases of dispute between himself

and the Chief Engineer were referred to the Electric Inspector. (*Mr. Green* here explained that the Electric Inspector was looked upon as the Electrical Adviser to the local Government.)

1,600. The firms which he employed for carrying out electrical work were employed as the result of a call for tenders. He was of the opinion that he would not be able to secure a better class of work if he were given staff to carry it out departmentally.

1,601. Asked as to whether there were any special reasons for the appointment of the Electric Inspector in Bengal, he remarked that there were two electrical officers in Bombay. One was designated "Electric Inspector" and the other "Electrical Engineer," and the latter not only performed the duties identical with his own but also attended to outside work in the *mofussil* with which he (the witness) was not concerned.

1,602. The expenditure on maintenance work in his division was Rs. 1,11,000 for the year 1915-16, and the cost of original works, Rs. 1,40,000; the latter figure however, varied considerably from year to year.

1,603. If there were a large hydraulic scheme under contemplation for Calcutta, the Public Works Department would not refer the matter to the witness but to the Electric Inspector.

1,604. (*Mr. Cobb.*) There were about half-a-dozen firms, in Calcutta, capable of undertaking electrical work, and there was sufficient competition between them. Hence prices were sometimes reduced by 25 or 30 per cent.

1,605. (*Mr. Green.*) The suggestion that the executive duties of the Electric Inspector should devolve on him would not appreciably increase his work, as there was very little work outside Calcutta at present. Outside work was confined to Darjeeling, Dacca and Chittagong, and the Electric Inspector did not often visit these stations as he could not spare the time.

1,606. (*President.*) He did not submit any reports to the Electrical Adviser to the Government of India, nor did the latter inspect his work officially, unless he was specifically asked to do so by the local Government.

1,607. The Electrical Adviser to the Government of India had no connection with electrical work in Bengal, and the only occasion, perhaps, on which he might be asked for an opinion was in an extreme case, *e.g.*, a power scheme for the whole of the Bengal Presidency, but a reference of this nature would be altogether special.

G. B. WILLIAMS, Esq., Sanitary Engineer to the Government of Bengal.

Written Statement.

1,608. I have been Sanitary Engineer in this province for the last eight years. During that period the methods of working in the Sanitary Engineer's Department have been entirely changed and the department reorganized. The experience so gained may possibly help to throw some light upon the questions raised in the Government of India resolution so far as Bengal is concerned.

1,609. When I was appointed in 1909 the duties of the Sanitary Engineer, Bengal, were almost entirely of an advisory nature. It was apparently intended that he should fill, as far as was possible, a position similar to that occupied in England by the Chief Engineering Inspector to the Local Government Board. When sanitary engineering schemes were submitted to government for sanction he criticised them, and if necessary returned them for amendment. He also advised the Sanitary Board, of which he was *ex-officio* Secretary, with regard to them. He sometimes drew up sketch projects or details for water-supply schemes, but even when he did he took no responsibility for carrying them out after they were sanctioned.

1,610. The result of this system was that there was at that time no progress at all in sanitary engineering in Bengal. It was necessary, if it was to be successful, that there should be qualified engineers in the employ of local authorities, or private firms, or engineers who could act for local authorities, who could draw up and supervise the execution of sanitary engineering schemes.

This was not the case. At that time there were in Bengal only two municipal engineers outside Calcutta who would have been competent to have prepared such schemes. There were no consulting engineers or firms except large engineering contractors, and if there had been, it is doubtful if more than a very small number of the municipalities could have afforded to employ them or, at any rate, would have done so. In one district, schemes for drainage were prepared by the district engineer, but these were not very satisfactory in design nor successful when they were carried out. I cannot find that a single sanitary engineering scheme was under construction in the whole province (excluding Calcutta) during either 1907 or 1908 with the exception of a few drains in Howrah.

1,611. It was obvious that the system was not a success, and, after studying the conditions for some time, I came to the conclusion that there was only one course open, and that was for the Sanitary Engineer to become responsible for the design and supervision of construction of almost all the sanitary engineering schemes in the province. Government consented to the change of policy involved, and the Sanitary Engineer's Department was reorganized and the establishment greatly increased. Since then, sanitary engineering schemes have been prepared by the department for almost every important town in the province. Before the war, the prospects of carrying a number of these into execution was favourable, but the war has reduced the construction programme to a low ebb.

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1,612. The following sums have been spent on new construction work each year since 1912 :—

	Rs.
1912	6,97,558
1913	11,32,128
1914	9,64,571
1915	7,30,390

The expenditure in 1916 has not yet been finally ascertained, but it was considerably less than in 1915.

The disturbance in the financial position caused by the war began to take effect in 1914, and has since had an ever increasing effect. If the position in the early part of 1914 had been maintained, I may safely say that by this time there would have been an annual expenditure of not less than Rs. 25 or 30 lakhs on sanitary engineering works.

1,613. The supervising staff employed on construction work, although under the general orders of the Sanitary Engineer, has been in most cases paid for by the municipalities concerned. Recently an alternative arrangement has been sanctioned by government, and the Sanitary Engineer can now take over the whole engineering supervision and control of the construction of schemes at fees which vary from 8 per cent. on the total cost of the schemes, in the case of schemes costing less than Rs. 20,000, to 3½ per cent. in the case of schemes costing over Rs. 10,00,000. I may note in passing that the supervision of small schemes is proportionately much more expensive than large ones. Several municipalities have availed themselves of this arrangement, and the percentage charged has hitherto been found sufficient to cover all the local supervising charges. The percentages are considerably lower than the corresponding charges of the Public Works Department, but in the case of the latter Department I understand a considerable amount is included for the Secretariat establishment charges and no corresponding charge is made in the case of the Sanitary Engineer's Department.

1,614. All works under the Sanitary Engineer's Department are carried out by contract. There are now a number of Calcutta firms accustomed to work to the Sanitary Engineer's specifications, and who are to be depended upon to do good work if properly supervised. In the case of one or two very small contracts the work has been carried out by local contractors. The average cost of the work constructed by the Sanitary Engineer's Department does not seem to differ very materially from the same class of work carried out by the Public Works Department. With regard to a good deal of the work, no comparison is possible, and in those items which it is possible to compare there is considerable variation, the rates being sometimes below and sometimes above the Public Works Department's schedules; on the average, however, they would work out to much the same.

1,615. Hitherto the local authorities have been responsible for entering into contracts for sanitary engineering works and for all payments made in connection with them. The contracts are subject to the sanction of the Sanitary Engineer and payments are made on his certificate. It cannot be said that this system has always been a success. Amongst a large number of the local authorities the sense of corporate responsibility seems to be very imperfect. It does not appear to be realized at all, by many members of municipal bodies, that in the case of municipal contracts there are obligations on both sides. Contractors are sometimes treated very badly and kept months or even a year or two for money owing to them, and in one or two instances at the end of a contract a municipality has, in an entirely arbitrary fashion, deducted money from the sum due under the contract on account of alleged damages sustained through non-completion in time, or for some other reason. In such a case, the contractor would have his obvious remedy in the law courts, but respectable firms of contractors are very unwilling to enter into litigation with local authorities before the local courts, and generally prefer to trust to pressure brought by government on the local authority. Any action on the part of govern-

ment takes a long time and is not always effective, and in some instances the Sanitary Engineer has been powerless to prevent a contractor suffering considerable loss owing to the vagaries of the local authority concerned. In consequence, contractors have expressed a strong desire that these class of works should be carried out directly by the Sanitary Engineer's Department so that they may be sure of getting their money, if they do their work properly. It is probable that in future some, at all events, of the sanitary engineering works will be carried out by the Sanitary Engineer's Department as contribution works under Public Works Department rules.

1,616. It will be seen from the foregoing that with regard to the work executed under the Sanitary Engineer's Department the tendency has been the opposite of that suggested in the Government of India resolution, and that it has been necessary to centralize more and more the control of the works carried out. This has been entirely due to force of circumstances. It was impossible for the sanitary progress of Bengal to come to a complete standstill, until sufficient sanitary engineers were trained to carry it on, and until local authorities were prepared to employ them. There has in fact been hitherto no demand for such engineers at all, and, judging from the strong opposition developed towards the appointment even of sanitary inspectors, it will be many years before any but a very small number of towns will consent to appoint municipal engineers, and those that do will pay such low salaries that they will not get highly qualified or experienced men. During the past eight years several hundred schemes have been worked out in my office, and these are now ready to go on with. If matters had remained in the state they were eight years ago, hardly any of this work would have been done at all.

1,617. So far as my knowledge and experience goes, therefore, I should say there was no prospect of substituting the engineering staff employed by local bodies for the Public Works Department in Bengal for a number of years to come. There are in fact no such engineers except the district engineers. The district engineers, I presume, have their time generally fully employed on their own work. In one or two instances works carried out under the Sanitary Engineer's Department have been supervised by district engineers, but this is not an arrangement I would willingly agree to again if it could be avoided.

1,618. So far as sanitary engineering is concerned, there is also no prospect of substituting private agency for departmental agency for a long time to come.

1,619. The Sanitary Engineer's Department in Bengal is not part of the Public Works Department, it is an independent department under the Municipal Secretary to Government. The relationship between the Sanitary Engineer's Department and the Public Works Department is satisfactory and harmonious. The Sanitary Engineer is always consulted by the Public Works Department in the case of any works involving sanitary engineering questions, and schemes for water-supply, drainage and sewerage for public buildings are worked out by him for the Public Works Department.

1,620. No works have been hitherto carried out by the Sanitary Engineer's Department under the Public Works Department Code. It is probable that they may be in future. I have found nothing in the Public Works Department Code that would be unduly restrictive in the case of such works, except that it would be necessary to give the Sanitary Engineer wider powers of accepting contracts that is possessed by Superintending Engineers under the Code.

1,621. My knowledge of the system of education in government engineering colleges is confined to that at Sibpur. I have had a number of young engineers from Sibpur in my department. They have been well grounded in engineering theory when they arrive. I consider their real education only commences when they start practical work. Any person who expected to get a fully qualified engineer from Sibpur, or any other college, would undoubtedly be disappointed, but the training

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the students have received there would, so far as I can see, enable them to take up any branch of civil engineering subsequently. In fact several ex-students of Sibpur have become successful and experienced contractors for sanitary engineering works.

1,622. It is not possible for me to say whether the Public Works Department could with advantage extend the system of execution of works by contract under departmental supervision. I was under the impression

that this system was already adopted in the case of important works. It is the only system in the Sanitary Engineer's Department. Beyond this I fail to see that any important changes in the direction suggested by the Government of India resolution are possible in the present condition of Bengal, which outside Calcutta and its suburbs is in a most backward state from an engineering point of view.

MR. G. B. WILLIAMS called and examined.

1,623. (President.) The witness stated that he was Sanitary Engineer to the Government of Bengal. He had been specially appointed to the post from England, and had held it for eight years.

1,624. Before he joined his present appointment he had had eighteen years' experience in sanitary engineering, and had been Consulting Engineer to the Crown Agents for the Colonies. He had specialised for the greater part of his career in sanitary engineering. At the time of his appointment the Sanitary Engineer in Bengal was considered a consulting engineer only and his duties were merely to advise on schemes submitted to him. His predecessor had on one or two occasions drawn up projects for water-supplies himself, but beyond that he had not, so far as he was aware, done other than advisory work. Since the witness' appointment the procedure had been changed, and the Sanitary Engineer now not only designed schemes but carried them out from start to finish.

1,625. He designed schemes for the water-supply and drainage of towns at the request of local bodies, besides government schemes, e.g., the Riparian water-supply scheme, which was not under the consideration of the local Government. In the case of government schemes the initiative had usually rested with either the local Government or the Sanitary Board. In the case of the scheme referred to above, he had been asked by the Sanitary Board to draw up the project. That scheme had no connection with the project which was being carried out for the improvement of waterways in Bengal. Most of the sanitary engineering work carried out, hitherto, had been located in the larger towns. Questioned as to the procedure for the construction of sanitary works he stated that work usually either came to him from the local bodies themselves or from outside sources, e.g., the Sanitary Commissioner, whose duty it was to inspect towns and report on their sanitation. Copies of these reports were always sent to the witness and sometimes when they were unfavourable he wrote to the local body concerned and inquired whether they wished to have a water-supply or drainage scheme drawn up. On receipt of a reply in the affirmative he prepared a sketch project, free of charge, and this was the first step. These schemes were sometimes proceeded with and sometimes abandoned. Generally speaking, local bodies required a certain amount of pressure before they actually reached the construction stage. In the second stage the scheme was submitted to the local Government through the Sanitary Board, it was then either approved or rejected. In the event of acceptance, administrative sanction was accorded to the scheme, and he then drew up the detailed project for resubmission through the same channel for technical sanction.

1,626. Municipalities paid fees for the preparation of detailed schemes, but these were generally refunded later by government, after the scheme had been successfully carried out. The fee for detailed estimates was 2 per cent. on the estimated cost of the work, and for engineering works which involved the preparation of contract drawings, specifications and forms of tender, the fee was also 2 per cent. In cases in which both the detailed estimates, drawings and contract drawings etc., were prepared by him, an inclusive fee of 3 per cent. only was charged.

1,627. Practically all the sanitary schemes executed during the last few years in Bengal had been carried out under his supervision. His supervising staff was an entirely temporary one, and varied according to the

amount of work he had on hand. He had on his books a considerable number of men whose qualifications he was well acquainted with. They came to him when vacancies occurred, and they were employed as supervisors of schemes with a staff of overseers and sub-overseers under them. At the present time very little work was being carried out, and the only temporary staff he now employed, in addition to his permanent office staff, were three supervisors, an overseer, a sub-overseer and a limited number of subordinates. The divisional Executive Engineers of the Public Works Department had no concern with the construction of his schemes.

1,628. His department was sub-divided into two divisions, water-works and drainage. The Assistant Sanitary Engineer's position was to some extent analogous to that of an Executive Engineer in charge of a division. One Assistant Sanitary Engineer supervised water-works schemes and the other drainage and sewerage projects. The municipalities concerned generally had no engineering staff of their own. The Howrah and Darjeeling Municipalities executed their own work; and the Chittagong Municipality had had an engineer until the commencement of the past year. These were the only towns in Bengal which employed really good engineers capable of doing sanitary work. The Burdwan Municipality had an engineer who had supervised the construction of their drainage scheme, but he would not have been qualified to draw the scheme up. That had to be done in witness' office. With the above exceptions the municipalities employed no engineering staff, beyond an overseer whose salary was generally between Rs. 30 and Rs. 50 per month.

1,629. Works under his department were carried out by contract. These contracts were generally split up because, in the case of a water-supply scheme, for example, the same contractor would not undertake the construction of buildings as well as contract for the supply of engines and pumps. For a water-works scheme the contract might be divided up into two or three, or even more, contracts, as the buildings were not designed until the machinery which would be required had been decided on. The usual practice was to commence with the contract for intake, head-works, mains and reservoirs, etc., then to proceed with that for machinery, and finally with that for the buildings in which the machinery would be housed.

1,630. The number of qualified sanitary engineering firms in Bengal, capable of taking up a fairly large contract, depended on the size of the particular work. For instance, a contractor who could undertake work up to Rs. 1,00,000 would probably not be in a position to take up a job of Rs. 10,00,000. For a small drainage contract of Rs. 20,000 he would probably receive tenders, if the work were in the neighbourhood of Calcutta, from fifteen to twenty firms. But for a large project like the Jherria coal field dam tenders had been submitted only by three firms. This was due both to the magnitude and complexity of the work which was a large masonry dam, and very few contractors in Bengal had had sufficient experience of this class of work. The system of giving out work on contract worked satisfactorily, so far as he was concerned. He had mentioned, in his written statement, that it was the only system followed by him, but that was not quite correct. One small scheme was at present being carried out in an out-of-the-way place, and a contractor for this work could not be obtained except at very high rates. In this work, therefore, he had resorted to the departmental system, i.e., by

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employing local contractors, and supplying them with the necessary plant and funds, and this was the only possible method which could have been adopted in this particular case. Difficulty was not generally experienced in obtaining contractors for work in towns outside Calcutta. Such works were in nearly all cases taken up by Calcutta firms who knew his methods of work and what he wanted.

1,631. In explanation of the statement in his written memorandum that an alternative arrangement had recently been sanctioned by government whereby the Sanitary Engineer could now take over the whole engineering control of the execution of a scheme, he stated that, as a matter of fact, the arrangement had not yet come into force, only the draft rules on the subject having so far been notified. The giving out of contracts by local bodies had not proved a success. In many cases contractors had received unfair treatment with regard to their legitimate claims. In fact some of the larger firms in Calcutta appeared to be very reluctant to tender at all for municipal sanitary engineering work, under present conditions, and some of those who had considerable experience of such contracts had informed him that they found it necessary to increase the rates at which they tendered to allow for the interest they frequently lost through the long delays in the payment of their bills.

1,632. So far there had been no opportunity for a local body to agree to hand over to him the construction of an entire work, but in the case of the Dacca sewerage scheme the municipality of that town, he understood, were anxious that it should be taken over by the Sanitary Engineer's Department, and had he believed passed a resolution to that effect. The scheme would probably be carried out by the Sanitary Engineer when funds were available. The municipality would, in the event of the work being carried out by his department, have to accept the completion certificate of the Sanitary Engineer. Government were contributing four-fifths of the cost of the scheme, so that the municipality was not so largely financially concerned as they might otherwise have been.

1,633. He advocated the construction of sanitary works by a separate temporary establishment, under the Sanitary Engineer, rather than by the ordinary Public Works Department staff, because, in the first place, he did not think the Public Works Department had ever evinced any anxiety to undertake such work, secondly because the Public Works Department officers were men inexperienced in sanitary engineering, and thirdly, because his department was quite capable of doing the work and could execute it better than the Public Works Department and as economically as, if not more so than that Department. He understood that this system was opposed to that elsewhere in force, under which the Sanitary Engineer merely designed projects and prepared detailed plans and estimates, and the construction was carried out by the ordinary Public Works Department staff, the Sanitary Engineer only inspecting the work from time to time to see that it was being properly carried out, but the system in vogue in Bengal was in his opinion much more satisfactory. The amount of detail which had to be decided upon during the construction of any important work was very considerable. In the case of a large scheme hardly a day passed without some question being referred to him by the men in charge. Such works were frequently inspected from his office. In the case of difficult construction once a week or more often. He himself had sometimes spent two or three consecutive days on a work. He anticipated that, if the Public Works Department had charge of large projects, they might experience considerable difficulty in the directions he had indicated. In the Darjeeling district, the Public Works Department had carried out the Kursong water-supply scheme without difficulty, but that was a small and straightforward scheme.

1,634. He had had two or three experiences of sanitary work having been carried out by the district engineer after it had been designed by the Sanitary Engineer and had found that the district engineer either was compelled to neglect some of his legitimate work or where he did

not do so failed to devote sufficient time to supervision. As a concrete instance, he quoted the case of a small addition to an existing water-works where the local people desired the supervision to be in the hands of the district engineer. When the latter was asked how much time he could afford to devote to it he replied "plenty, at least four visits a month." That would have been in his opinion absolutely inadequate. His idea of supervision was that a competent man must stay on the work all the time and see that it was properly done.

1,635. No mechanical engineer was employed by the Government of Bengal. He generally drew up the specifications, etc., for the mechanical portions of projects himself, but minor details were not amplified as within certain limits it was left to the contractor to indicate what he desired to put in. In the case of pumping machinery he very often supplied alternative specifications of two or three different kinds of machinery. In these specifications he indicated how much work the pumps would be required to do, the maximum consumption of fuel, and that a guarantee would be required of the contractor, and made sure, when the contractor submitted his tender, that the full details and plans of what the latter proposed to instal were shown. He had found that this arrangement proved satisfactory.

1,636. He had felt the necessity for a mechanical engineer and hoped to get one on the cessation of the war. He would like a mechanical engineer attached to his department who would not only have charge of new machinery contracts but would also inspect the machinery at existing water-works and dispose of the many mechanical questions which arose in connection with these.

1,637. He had not had experience of any water-supply or drainage scheme which had been both designed and constructed by a private firm in Bengal, and could not say whether it had been the practice at any time prior to his appointment for municipalities to apply direct to private firms for the execution of their sanitary work instead of applying to the Sanitary Engineer. During his incumbency no case of that kind had occurred and he did not consider such an eventuality likely now that the Sanitary Engineer had a sufficient establishment to do the work. He knew of several cases in which schemes had been prepared by large contractors in Calcutta, but these schemes had not actually been carried out. In the case of the Jherria coal field scheme, the municipality had called in a large contractor who drew up a project for the water-supply by pumping. When the witness examined it he had found it was in a very crude state, and it was subsequently abandoned in favour of the gravitation supply project which he had prepared and which possessed obvious advantages over the pumping scheme. On further interrogation he stated that he knew of one or two cases in which municipalities had asked private firms to submit schemes. Present procedure required that these bodies should eventually refer all schemes to him, and he scrutinised all designs before work was actually started. When consulted by local bodies private firms often came to him for advice and approval of their ideas. The Sanitary Branch of the department was entirely distinct from the Public Works Department, and he was not subordinate to the Chief Engineer. He did not know how this arrangement came into force. There was no record in his office but he considered that it worked quite satisfactorily. His schemes when submitted to government for sanction were examined by the Sanitary Board of which both the Public Works Department Chief Engineers were members. Under the rules, the Sanitary Board was not responsible for the engineering details of a scheme, but for the general design only. The responsibility for the soundness or otherwise of a project from an engineering point of view devolved on him.

1,638. He considered that the system in vogue in Bengal had proved satisfactory, but he did not know that there would have been any great difference in efficiency if the Sanitary Engineering Branch had been actually a branch of the Public Works Department,

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since he presumed that the Chief Engineer would have allowed him to work independently.

1,639. There was no specialization in sanitary engineering at the Sibpur College. The students went through a general elementary course of sanitary engineering, which was one of the subjects for the Bachelor of Engineering course, but he was not quite sure whether it was optional or compulsory. So far as the needs of sanitary engineering in India were concerned, he thought that the students turned out from the Sibpur College were as satisfactory as could be expected. Their theoretical training was good, but he did not attach much importance, in the case of a man fresh from college, to a detailed knowledge of sanitary engineering; he would rather have one who knew more about other branches of engineering and himself instruct him in the design of sanitary projects.

1,640. Some of the passed students of the Sibpur College had started as contractors a few years after leaving college, these were men who had passed out of the college several years ago and who had not been employed by him. He further knew of one or two men who had formerly been employed by him and who, having been dismissed owing to the reduction in his establishment, had joined firms of contractors as contractors-agents or engineers in which work they were doing quite well.

1,641. (*Mr. Cobb.*) When passed students came to him, they received a government scholarship and lived on it. After their first year their scholarship terminated but until the war broke out, as he had plenty of work on hand, he had nearly always been able to take them on as junior assistants and start them on a salary of between Rs. 100 and Rs. 120 a month.

1,642. He thought it better not to discuss the reasons for the treatment meted out to contractors by local bodies.

1,643. (*Rai Bahadur Ganga Ram.*) Before he was article to a civil engineer he had spent a year in a mechanical workshop. He had not been to a University, but had received a very good mathematical training at his public school where he was head of the military and engineering side. He had thus received practical training in mechanical as well as sanitary engineering. He had not taken any degree in civil engineering, but he was a Member of the Institution of Civil Engineers. He had Executive Engineers under him, in the persons of his Assistant Sanitary Engineers, for the purpose of executive work. Temporary establishment was employed for each work, but the Assistant Engineers were permanent men.

1,644. If a water-supply scheme were sanctioned in the *mofussil*, the Assistant Sanitary Engineer of the Water Works Division would be the Executive Engineer for that scheme and pay frequent visits to the work though he lived in Calcutta, and a temporary man would be employed as resident supervisor. He had worked out, roughly, the percentage of establishment to the cost of schemes and the figures were contained in his written memorandum. For a small work, the supervision charges worked out to approximately 8 per cent. and for a big one to about 3 per cent. These charges included only the temporary establishment, and did not include the salaries of either himself or the Assistant Sanitary Engineers.

1,645. He had carried out all his work by contract, with the exception of the small work, previously mentioned, which was situated in a remote locality. Large contractors required just as much supervision as small ones, even when they had their own trained engineers. He had had a great deal of experience of large contractors in England.

1,646. (*Mr. Mackenzie.*) A Member of the Board of Revenue was the President of the Sanitary Board. The official members were the two Chief Engineers and the Sanitary Commissioner. In addition to these there were three non-official members, two Indians and one Englishman, making seven in all. No delay was caused by reference to the Board as it met once a month, and the schemes which came before it were dealt with very promptly.

1,647. (*Sir Noel Kershaw.*) In one or two instances on the termination of a contract, the municipality concerned had, in an arbitrary manner, deducted money from the sum due to the contractor on account of alleged damages sustained through non-completion of the contract in time or some or other reason. In these cases the action of the municipality was highly questionable even though there was a condition laid down in the contract that the works should be completed within a time-limit. The Sanitary Engineer was the final arbiter according to the conditions of contract.

1,648. The provincial civil works budget included the supervision charges of his permanent staff; not that of his temporary staff. His works establishment was paid for out of a lump sum grant which varied according to circumstances. Before the war it had been Rs. 30,000, but it had been cut down. In fixing the fees payable to government for the supervision work done by his department he did not take into account his permanent staff at headquarters.

1,649. If the cost of the latter were all charged to the schemes under construction it would make a considerable difference in the 3 to 8 per cent. charges previously mentioned, in fact it might bring them up to the Public Works Department charges of 23½ per cent.

1,650. (*President.*) The question regarding the best method for the recruitment of Sanitary Engineers hinged on how it was proposed to reorganize the Sanitary Engineer's Department. If it was to be part of the Public Works Department, recruits could be obtained through that Department, but if it was to form an entirely separate service, recruits would have to be obtained direct, either from England, or India. The field for the direct recruitment of Sanitary Engineer officers in India was very limited. The only two alternatives he could think of were, either to recruit from Europe, or to fill the posts by the appointment of suitable officers from the Public Works Department, but the former method was certainly better under present conditions.

1,651. He did not agree with the suggestions that, for sanitary engineering in India, experience of Indian conditions was of absolutely vital importance, that the conditions were so different from those prevailing in western countries that recruitment should not be made direct to the post of Sanitary Engineer from England, and that it would be preferable to take a civil engineer from the ordinary Public Works Department with no sanitary engineering qualifications whatever. He explained that when he first came out to India the only experience he had had of eastern ways of working was obtained in East Africa where he had spent some time, but that experience was by no means great, and he had found that he had to unlearn a lot of things and learn afresh, but he soon became acquainted with the Indian methods of working. Likewise, one of his Assistant Sanitary Engineers had had no experience of Indian conditions when he first came out, but after two years he was as perfectly competent to deal with any engineering matter as a man who had been out in India for ten years. He would disapprove of a system under which, for the post of Sanitary Engineer, a civil engineer would be recruited from the Public Works Department with no special qualifications in sanitary engineering, and would prefer to have a man who had had a good training in sanitary engineering and who had never been out of England to one who had had experience of Indian conditions but no experience of sanitary engineering. He thought that the specializing of an Indian officer of the Public Works Department would not be likely to be sufficient for the post of Sanitary Engineer, because such specialization would have taken place either a good many years previously, and his knowledge would therefore be out of date, or have been acquired hurriedly during leave, and the experience which could be so obtained would not in his opinion be sufficient to qualify him for the post.

1,652. He had two Assistant Sanitary Engineers, one of whom was recruited from the imperial Public Works Department, and the other direct from England; the former was a seconded officer. The normal method of recruitment for the post of Sanitary Engineer should

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be as far as possible by the promotion of an Assistant Sanitary Engineer when a vacancy occurred. For recruitment to the post of Assistant Sanitary Engineer he would bring out a man a little older than the ordinary Public Works Department officer, and would select those who had been on first-class engineering works in England. If the Sanitary Engineering Department was a part of the Public Works Department it might be an advantage to send these men to that department first of all for a year or two before employing them as sanitary engineers, because they would then obtain a wider all-round knowledge of Indian engineering. When once a man came to his department he thought he should stay there, because sanitary engineering was of sufficient importance to justify a man's making it his life's study, but the prospects in the department should be improved to secure that end.

1,653. (*Rai Bahadur Ganga Ram.*) If he made a mistake in a calculation in a sanitary project, he was responsible. He understood that, in other provinces, schemes went before the Chief Engineer and they were checked by that officer as well as by his Under-Secretary. This

system was, he was informed, followed in the Punjab and the United Provinces but he did not recommend it as he thought that the man who designed and carried out a work should be held responsible for it, and that, if he made a mistake he deserved censure. In Bihar and Orissa the system was much the same as in Bengal. As regards keeping himself acquainted with sanitary engineering work in other provinces he stated that he had attended the discussions of the sanitary conferences up to the year 1914, but that since then there had been no conferences.

1,654. (*Mr. Mackenzie.*) There were sanitary institutions of sorts in England which gave diplomas, but he did not think they were of much value. Men who went to England sometimes returned with various letters after their names which were not of the slightest use.

1,655. He had formulated a scheme for the training of subordinates in England which the local Government had accepted. It would be carried into effect after the war. Under the scheme each of his Assistants would in turn be sent to England, and put on to large sanitary works under a first-class English engineer.

At Calcutta, Tuesday, 6th February 1917.

PRESENT :

F. G. SLY, Esq. C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

C. S. COBB, Esq., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

The HON'BLE MR. H. H. GREEN, Chief Engineer and Secretary to the Government of Bengal, Buildings and Roads Branch.

D. G. HARRIS, Esq. (*Secretary*).

The HON'BLE MR. F. O. LECHMERE-OERTEL, A.M.I.C.E., F.R.I.B.A., Chief Engineer and Secretary to the Hon'ble Chief Commissioner of Assam.

Written Statement.

1,656. The Public Works Department Reorganization Committee have already been supplied through the Public Works Secretary to the Government of India with full particulars of the system in vogue for the execution of civil works in Assam. From this they will have seen that in some respects we are already working on the lines indicated in the Government of India's resolution of 24th November 1916, in entrusting less important works for execution to local bodies such as municipal and local boards, civil departments (jails, police and educational), cantonment committees, as well as civil officers such as the Political Agent at Manipur, the Political Officer of the North-East Frontier, and the Deputy Commissioners of the Lushai, Naga, Garo, and Khasi Hills. This latter system is perhaps peculiar to Assam, where the roads and buildings concerned are often in out-of-the-way and wild places, visited only by the local civil officer who alone can obtain the necessary labour.

1,657. Local boards in Assam at present employ their own subordinates for their works, and in regard to these local works Executive Engineers occupy much the same position as Local Government Board Inspectors in England. All Executive Engineers in Assam are *ex-officio* "Inspectors of Local Works" for all local boards within their divisions.

1,658. Special legislation has lately been passed in Assam empowering local boards or groups of local boards to employ their own engineers, so that they can carry out all their own works including major works. Except in one case, no advantage has so far been taken of this

special legislation; but when the war is over and financial conditions are more favourable, it is hoped that it will lead to considerable decentralization.

1,659. Some important municipal works are being carried out through the agency of large Calcutta engineering firms, directly under the control of the municipalities concerned. The works referred to are the water-works now under construction at Tezpur, Dhubri, Sylhet, and Silchar. The Sanitary Engineer inspects and passes these works on behalf of the local Administration.

1,660. The points raised in paragraph 2 of the Government of India's resolution of 24th November 1916, on which the local Administration's views are invited, are noted on *seriatim* below :—

- (i). It has long been felt that the present methods for the execution of work by the Public Works Department are susceptible of improvement in the following amongst other directions—(a) by the simplification of the procedure and accounts rules, (b) by decentralization especially in the delegation of greater powers to Executive Engineers, and (c) last, but not least, by the introduction of a more convenient Public Works financial year which does not end in the middle of the working season. This last reform has often been urged upon the Government by Public Works Department officers. In Assam the hampering effect of the present financial year is perhaps more keenly felt than in other parts of India, and occasion was taken to address the Government of India on the

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subject. Extracts* of the local Administration's letter and of the Government of India's reply are annexed.

- (ii). Work in Assam is at present executed almost exclusively through the agency of contractors, so that private enterprise is already employed to the fullest possible extent. Most of the works are carried out by petty Indian contractors; there are a few larger works, however, such as the water-supply schemes for Tezpur, Dhubri, Sylhet, and Silchar, which are being carried out by large Calcutta engineering firms. There are no large contracting firms, employing engineers of their own, in Assam.
- (iii). Changes in the organization of the Public Works Department staff are desirable, and some suggestions on this point are made further on.
- (iv). The present Public Works Department system seems to meet the needs of other departments sufficiently well, as far as large works are concerned, but in regard to petty works it might be advisable to give other departments a freer hand in carrying them out under their own supervision.

The sub-divisions referred to of the Buildings and Roads Branch do not exist in Assam, where all kinds of work, not only sanitary, architectural, and electrical, but also irrigation and military works are carried out by the Public Works Department.

- (v). Further decentralization seems advisable, especially in the direction of giving greater powers to Executive Engineers, who are mainly responsible for the execution and accounting of civil works.
- (vi). The procedure laid down in the Public Works Department Code for the execution and accounting of works has become so complicated that it seriously affects both speed and economy, and requires trained men to understand it. Therefore, even if it be considered necessary to retain it in some form for the Public Works Department itself, simpler rules should be introduced for local boards and other outside agencies giving them greater freedom of action. In Assam, on account of its great distances and want of quick communications, local civil officers in out-of-the-way places have been for a long time entrusted with the construction of civil works within their districts. This has worked well enough, but the cry has been continually for simplification of procedure. Experience has shown that civil officers cannot be expected in such cases to follow all the minute regulations required of them as Public Works disbursers, a position analogous to that of an Executive Engineer. The enforcement of these rules leads to endless audit objections frequently on petty points. Unless civil works can be entrusted to local agencies, without all the vexatious restrictions of the Public Works Department Code, there is very little gained by making them over at all.
- (vii). The government engineering colleges in India were primarily established to educate engineers for the Public Works Department and, as such, they have proved successful. But to meet all the needs of private enterprise a broader education is necessary. It should include, for instance, mechanical, mining, and sanitary engineering of a sufficiently high standard to do away with the necessity for sending Indian students to England to acquire knowledge in these special branches of engineering. Architecture also should not be lost

sight of. It is a reproach to India with its magnificent monuments of the past, both Hindu and Muhammadan, that there should be no schools for the study of Indian architecture. If engineering schools are not considered the right places for this purpose, opportunities of architectural study should be provided at the Schools of Art.

- (viii). Engineers educated in England get their practical training there before coming out to India, and they are appointed straight as Assistant Engineers to the Public Works Department, but it is the practice to employ them during their first year as apprentices on large works so as to teach them something of Indian methods and workmen. All the engineering students from Indian colleges are given one year's practical training on government works, even if not afterwards employed in the Department. In the latter case, a second year's training might be allowed to those who have gained good reports, as one year is hardly enough to qualify them for private employment.

1,661. The task set to the Reorganization Committee appears to be of a threefold nature:—

- (a). The reorganization of the Buildings and Roads Branch of the Public Works Department including changes in the establishment and procedure.
- (b). Gradual substitution, as far as possible, of private for departmental agency in the execution of public works.
- (c). The improvement of Indian engineering schools and colleges to place them in a position to turn out the right class of engineers and subordinates.

1,662. Any* changes in the staff of the Public Works Department, as the Government of India have already pointed out, must be very gradual, so as to avoid hardship to the existing members of the service and to allow for the development of the new conditions aimed at. If a higher standard of education is to be exacted from Indian engineering colleges and a better class of candidates is to be attracted, it is necessary to hold out higher inducements, and if the requirements are to be equal to those of English colleges, the reward should also be. In order to attract the right class of Indian candidates to the Public Works Department, it is suggested that the distinction of "imperial" and "provincial" should be abolished and all appointments made to one service on an equal footing for all, whether recruited from England or India. Less highly-paid appointments corresponding to the provincial service might be created for district and local board engineers as proposed by the Government of India. Only a few of the appointments in the Public Works Department should be given direct to men from English and Indian colleges, the rest being reserved for selected local board engineers and private practitioners. The selections of the latter might be made irrespective of age from the best qualified men, the initial salaries being fixed in accordance with their standing and acquirements. In order to make this form of recruitment possible, it will be advisable to abolish the present system of pensions in the Department and to substitute for it some form of subsidised provident fund similar to the funds existing on railways in India, which are contributed to by government or the railway companies, as well as the engineers themselves. Such a system would not only remove all difficulty in bringing outsiders on the cadre of the Department, but it would also make it easy to weed out incompetent men from the service. That the present pensionable Public Works Department service does not afford facilities for bringing in outside specialists such as archi-

* Please see in this connection Chief Commissioner's note, dated the 21st April 1913, submitted to the Public Services Commission.

* Not printed.

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pects, sanitary and electrical engineers is acknowledged. There would be no objection to such a scheme on the part of the engineers concerned, inasmuch as it is easy to make the value of the government contributions to the fund equal to the value of the present pensions. There might be difficulties on the part of the government, as they would lose the strong hold over their officers which pensions give and there would no doubt be some risk of officers leaving the service in order to take up private employment, but as the object of the present inquiry is to encourage and assist private enterprise in India, this ought to be no objection.

1,663. The fact that there is a provincial service creates an invidious distinction between English and Indian training and as long as this exists, one cannot hope for a better class of engineers from Indian colleges. Engineering is a practical science learned not from books alone, and engineers must be judged by their subsequent work, and not by the college from which they come. What is wanted is not an inferior class of provincial engineers in addition to the imperial engineers, but a better stamp of upper subordinates, and as long as the provincial service exists, it is useless attempting to raise the standard of the upper subordinate service, as it would bring it into collision with the provincial service. It has long been felt that there is not room for both these services.

1,664. The English-trained engineer will always have an advantage over his Indian colleague at the start, owing to his being brought up in environments affording him an unconscious practical training from his earliest youth up, and which at present is unfortunately almost entirely absent in India. In house and street the English boy is constantly brought into contact with mechanical and electric contrivances of all kinds, while in his toys and games he is imbibing practical lessons of engineering to an extent unknown in India. No system of subsequent education will quite make up for this want and we can only attempt to supply it to some extent in our preparatory schools out here by having good hostels and

surroundings for the boys, and by the introduction of manual training, carpentry, and practical chemistry. Until India has made great strides, industrially and scientifically, this difference will exist to the detriment of Indian students. At the same time it cannot be considered insuperable. Experience has shown that to the better men such obstacles only act as incentives urging them to greater efforts and eventual success.

1,665. So far as Assam is concerned, the standard of the Indian engineering colleges is quite as high as can be aimed at with the present inducements. It is only found possible to send Assam stipendiary students to the Sibpur Engineering College, where the entrance qualification is restricted to the F.A. or Intermediate Arts and Science examination. No stipend, however, will induce students to try for Roorkee, since for that college candidates must be Bachelors of Art or Science, and in addition must gain a place in a competitive entrance examination. This means that a young man, after taking a high university degree, may come out too low on the list of competitors for the Roorkee entrance examination to be admitted to the college; and thus, at the age of 20, after an expensive and prolonged training, may find himself stranded without any definite aim in life.

1,666. This fact was brought to notice when inquiries were made into the possibility of sending students from Assam to Roorkee, which is at present the main source of supply for the recruitment of provincial engineers in Assam, since as many as 6 and 7 guaranteed appointments are made in alternate years from that college. Every year two students are sent from Assam with government stipends to the Sibpur College, but as there is only one guaranteed appointment annually from that college, and as this is generally gained by one of the Bengali students, who are much more numerous, all that can be offered to qualified Assamese engineers is a possible appointment in the upper subordinate service, and even for that they will have to put in several years on probation.

The HON'BLE MR. F. O. LECHMERE-OERTEL called and examined.

1,667. (President.) The witness stated that he was the Chief Engineer and Secretary to the Chief Commissioner of Assam, and explained that there were two circles of superintendence in Assam, held respectively by the Chief Engineer and a Superintending Engineer. In addition to his proper duties as Chief he performed those of a Superintending Engineer.

1,668. There were eight executive divisions in Assam, which, with one exception, corresponded with one or more civil revenue districts. This exception was Sylhet, portions of which district had recently been transferred to another division to equalise work.

1,669. There was at present no specialization in the Assam Public Works Department, but proposals for the appointment of a Sanitary Engineer had been made to the Government of India. So far an Assistant to the Chief Engineer was responsible under the latter's orders for sanitary engineering work. This Assistant, when appointed to the post of Sanitary Engineer, should remain subordinate to the Chief Engineer.

1,670. Normally, the expenditure on public works in Assam averaged about Rs. 54,00,000 a year for original works and maintenance, inclusive of expenditure on establishment. The expenditure on original works and maintenance alone, excluding departmental charges, amounted to about Rs. 46,00,000.

1,671. There was no separate Irrigation Branch in Assam, nor any necessity for regular irrigation works, as the rainfall in the province was abundant. There were, however, some works classed as irrigation and shown under the head of "Minor Works and Navigation" such as bunds and embankments, and reclamation and drainage work. He expressed the hope that a special branch would be formed in the course of time for dealing with navigation works in Bengal and Assam, such a branch being badly required.

1,672. Tenders were invited in Assam by advertisement in the government gazette and in the local papers, and by notices posted up in the government offices, not only in the district to which the work related, but also at headquarters stations in the province. If for instance a work was required to be constructed in Gauhati or Tezpur, notices calling for tenders for it were also posted up in the public offices at Shillong. As a rule tenders were invited for entire projects but occasionally where a project consisted of distinctly separate items, separate tenders for each head were invited, e.g., in the case of projects for water-works, machinery was supplied and erected by a contractor other than the one engaged for building construction. Ordinarily building projects of any magnitude were given out as a whole, except in so far as they related to the supply of materials, such as bricks, lime and timber; these being sometimes supplied by government. In special cases, e.g., in the new North-East Frontier station in process of erection at Sadiya, estimated to cost over Rs. 10,00,000, the Public Works Department was collecting its materials beforehand, and this alone would take several years. In the case of the Sadiya project, a Punjabi contractor was engaged for the supply of bricks and labour, and another contractor for the supply of timber and lime. He explained that, although the supply of materials was ordinarily included in the tender for a whole work, it took time in the case of large projects to collect a sufficient supply of materials in an undeveloped country like Assam. The collection of bricks at Sadiya for example took a couple of years. Moreover the working season in Assam was short and months were sometimes occupied in importing the necessary labour. It was possible that a contractor might tender for an entire large project, including the supply of materials; but there were no contractors of such standing in Assam at present, and such a man if required would

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have to be imported. For projects of ordinary size such as schools and dispensaries it was possible for contractors to arrange for the supply of both labour and materials.

1,673. Certain large firms of contractors in Calcutta had undertaken the construction of water-works at various centres in Assam. The designs for these schemes were prepared in the Chief Engineer's office with the help of his Sanitary Assistant, and contracts were given out for the actual construction of the work. It was the practice to consult reliable firms and to obtain their opinions beforehand as to the most suitable types of pumps and engines. The firms consulted were requested to submit tenders, and each was informed that other firms had also been asked to tender. The lowest possible rates were thus secured.

1,674. Road construction was carried out by petty contractors, who were mainly suppliers of labour. The construction of a long length of road by lump sum contract had been tried in the case of the Lohit Valley Road, but the difficulties proved so great that the scheme failed though the contractor engaged was a European. With the exception of the cart roads to Shillong and Manipur practically all the roads in Assam were unmetalled. As *kutcha* roads did not require skilled labour, the Public Works Department was endeavouring to persuade local men, such as tea planters with gardens adjoining the roads, to undertake their maintenance, and in this they had met with partial success.

1,675. Subject to Public Works Department supervision the repairs of their own buildings by other departments might prove satisfactory in some cases. He had not had any personal experience of such a system, but was of opinion that certain departments, such as the Jails and Police, would welcome the change. The practice in Assam was that permanent buildings were always repaired by the Public Works Department, but temporary buildings were sometimes maintained by their own departments. These temporary buildings were thatched bamboo and wattle huts known as "*bashas*," a great number of which were in use in Assam owing to the want of funds. These he considered could best be maintained by the departments concerned. The retention by the Public Works Department of the maintenance of important buildings was desirable, as their regular repair might otherwise be neglected. He added in confirmation of this view that there had been cases in which the Public Works Department had been obliged to take back buildings from other departments owing to their having been allowed to fall into a state of disrepair, the repair grants having been spent on additions or other works.

1,676. Local boards in Assam could not afford an expensive engineering staff; they only employed a subordinate establishment, usually consisting of one upper subordinate and one or two lower subordinates. The Local Self Government Act lately introduced empowered local boards to employ engineers—but there was little prospect of their taking advantage of this at present, as owing to war economies their finances were at a low ebb.

1,677. Local boards in Assam did no government works; they attended only to their own less important works, and made larger works over to the Public Works Department. No charge was levied by the Public Works Department for the works thus executed; on the contrary, government had often to help with funds. The local Administration was empowered to do work of this nature gratis, and though it was permissible for the Public Works Department to levy a charge, it was in fact never demanded.

1,678. With regard to the scheme for the reorganization of the Department by which the bulk of the work should be done by district engineers with a comparatively small superior Public Works supervisory staff, he remarked that this scheme was rather a goal to be aimed at than an achievement to be immediately accomplished, especially in a backward province like Assam. Moreover it was not advisable in the interests of persons already in the Department to attempt to hurry the change. The reorganization of the Department as a

whole, with greater decentralization, ought to be first undertaken.

1,679. The present system, of which the witness had had thirty-four years' experience, was embodied in the Public Works Department Code. This Code was far too cumbersome and centralised through an attempt to embrace in one set of rules all the varying conditions of a vast empire. The Public Works Department owed its inception to a military man, General Sir Richard Strachey, who had rightly earned the title of 'the founder of the Public Works Department.' That officer naturally organised the Department on military principles, sacrificing everything to disciplinary control and uniformity. As an example of such uniformity he quoted the case of military barracks where a standard plan and specification were laid down for everything, giving the minutest details down to the numbers of screws and bolts. Under this system the Public Works Department had from its very commencement been imbued with military ideals, and as a fact, the Executive Engineer in northern India was still known as 'the barrack-master *sahib*'—a relic of the time when he was in dual charge of both civil and military buildings. The first manual of specifications, the "Military Works Hand Book," was written by a civil engineer, Mr. Tyndall. The attempt to lay down rules, specifications and standard plans for every conceivable contingency, though it might seem to simplify work, deprived officers of all initiative and hampered work. Hence the whole of the Public Works Department Code should in the witness' opinion be scrapped, and each local Government allowed to draw up its own regulations, culling from the existing Code only such rules as were suitable to the province. Local governments should first be freed from the minute control of the Government of India, and then encouraged to delegate adequate powers to the local bodies under them. The appointment of a committee for the revision of the Code might be necessary.

1,680. The rules for the supply of European stores were in his opinion cumbersome and inapplicable to the Buildings and Roads Branch of the Public Works Department, as the quantity of European stores used by that branch was comparatively small. He therefore advocated for this branch the removal of the present restrictions and the free purchase in India of all descriptions of stores of European manufacture. The rules in their relation to railways were on a different footing; their demands were on a large scale and could be obtained more economically through the India Office. The services of the India Office would still be available for special requirements, if desired, when these could not be obtained locally. He added that his proposal would act as an encouragement to local engineering firms. The quality of the stores obtained through the India Office was good; his complaint chiefly related to the delays involved. There would be no danger in the concession, since the recognised firms in India were already listed and only approved specifications would be permitted. As an additional precaution arrangements could be made for testing stores at centres such as Calcutta and Bombay. This proposal did not necessarily involve the maintenance of a separate Stores Department in India, as the machinery for the purpose was already available there and was used for testing local manufactures, but there was no good reason why its activities should be confined to this alone. In Calcutta materials were, witness thought, tested at the Sibpur College.

1,681. The rules for churches and cemeteries were also very involved and occasionally led to anomalies. As an example he cited the case of the church in Sylhet which had a wooden shingle roof that required renewal. The church itself was a wooden one and if the roof were not renewed without delay the whole structure was in danger of collapse. With a view to economy and durability, the replacement of the wooden shingle roof by corrugated iron sheets was suggested. Under the Code rules this made it an "original work," and therefore it had to be submitted to the Government of India for sanction. The more costly repair scheme for replacing the wooden shingle roof could have been sanctioned at once by the local Administration but the Code barred even the Government of India from sanctioning the cheaper scheme

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and it took a whole year of correspondence before the objection could be overcome.

1,682. Powers of technical sanction up to Rs. 15,000 had been delegated to the Superintending Engineer in Assam. These had not been raised to the maximum permissible limit of Rs. 50,000 as the present incumbent was only officiating but his predecessor held the full amount. Executive Engineers in Assam had powers of technical sanction up to Rs. 2,500, and he considered that their powers might be raised to Rs. 25,000. That limit was only the cost of an ordinary building, and could appropriately be vested in the Executive Engineer by reason of his being the officer who was mainly responsible for building schemes.

1,683. Sub-divisional officers had no powers of sanction in Assam, they made only petty cash payments from their imprests. The system in force in Assam was more or less the same as that in Bengal, where the Executive Engineer made all disbursements and issued cheques on bills submitted to him by his subordinates. There was no reason why sub-divisional officers in Assam should not have disbursing authority and other powers, but any change would have to be introduced gradually and with caution, as a great deal depended on the personality of the officer concerned. He was not in favour therefore of an indiscriminate extension of their powers, though he would not hesitate to give sub-divisional officers of standing, i.e., senior upper subordinates or Assistant Engineers, extended powers.

1,684. Lower subordinates were not, as a rule, placed in charge of sub-divisions but where this was the case he did not advocate the bestowal of extended powers upon them. The grant of further powers, in his opinion, should be confined to trustworthy officers of the classes he had indicated.

1,685. The simplification of accounts hinged entirely on the procedure; any simplification in the latter would necessarily lead to simplification in the former. The accounts system in vogue was certainly complicated, and the decentralization he had recommended should result not only in a simpler Code, but also in simpler accounts.

1,686. A "minor work" in Assam was one which cost less than Rs. 5,000, and a "petty work" less than Rs. 200. The limit for petty works might, with advantage, be raised to Rs. 2,500. Sub-heads of account were not maintained for all minor works. The "register of works" might be simplified by the omission of a certain amount of detail but as he was more in favour of a root and branch simplification of procedure, he was not prepared to make further specific recommendations in that connection.

1,687. He was strongly in favour of an alteration in the present financial year in order to close it at a more suitable time for the Indian working season, i.e., at the end of June. The present financial year, ending in the middle of the working season, resulted in heavy annual loss to the government not only in the Public Works but also in other departments, such as the Revenue and Forest Departments.

1,688. Adverting to the proposed reorganization of the Department the witness said that when he joined the service more than 30 years ago he was posted to the United Provinces, which then had separate district engineers subordinate to the district boards and apart from the Public Works Department establishment. As that system did not prove successful it was replaced by a system of district engineers who were sub-divisional officers under the Public Works Department and subordinate to the Executive Engineers. The old district engineer system might possibly work well if it were not for the cumbersome Code rules, but any attempt to require district boards to work according to those rules was pre-doomed to failure. If district boards employed their own engineers they might be made responsible for government work entrusted to their care. He admitted, however, that such an arrangement would lead to a duplication of staff, as it was essential that Public Works Department inspectors should, at the beginning at least, supervise district board work, although ultimately it

might be possible to hand over public works, both imperial and provincial, to district boards.

1,689. The introduction of the proposed reorganization scheme would not result in any material reduction in the existing Public Works Department cadre, as other duties would manifest themselves with the scheme's development and make it impossible to effect an appreciable decrease in establishment. The eight executive divisions in Assam comprised fourteen civil revenue districts, and each Executive Engineer held charge of several such districts. For instance, the Executive Engineer at Gauhati had charge of the Kamrup, Goalpara and Garo Hills districts, and it required a great deal of time to journey from one end of the division to the other. With these enormous beats there would be no excess of staff in Assam, whatever system were adopted.

1,690. The recommendation of the local Administration for the substitution of a provident fund in place of pensions was made prior to the receipt of the report of the Royal Commission on the Public Services in India. As the proposals of the Commissioners were, in the witness' opinion, quite sound, no change was called for in respect to officers already in the Department; but for specialists, such as Electrical and Sanitary Engineers and Architects not included in the Public Works Department cadre, the equivalent of a pension might be secured by compulsory contribution towards a provident fund.

1,691. In the remote districts of Assam such as the Garo, Lushai, Naga and North Cachar Hills and Manipur, civil officers acted as agents for the Public Works Department in the construction of works, but this applied only to inaccessible posts where the civil officers were able to see to this work easily during their tours. Such work consisted chiefly of bridle paths, small bridges and temporary buildings; the assistance of the Public Works Department was invoked for the erection of large bridges. The construction of the ordinary permanent buildings in the districts he had named was also undertaken by the civil officers with the assistance of upper subordinates and no departmental supervision was exercised over the repair of such buildings.

1,692. (*Sir Noel Kershaw.*) The average annual expenditure of Rs. 46,00,000 he had mentioned included both imperial and provincial expenditure. It related to fourteen districts, and therefore, averaged about Rs. 3,30,000 for each district. About two-thirds of the average of Rs. 46,00,000 was spent on major works, but the ratio naturally varied according to the amount of work on hand. A great deal of road work had recently been undertaken in Assam. For instance, the Lohit Valley Road alone cost Rs. 26,00,000 to construct. That road was not a metalled one, but only a bridle path which communicated with the frontier districts and led towards China. A large work of this description necessarily increased the average provincial expenditure. The construction of major works required a considerable amount of engineering skill, and though the Lohit Valley Road was merely a bridle path, there was a great deal of difficult and important work on it in the shape of suspension bridges, etc., which could not be entrusted to a man of the calibre of the proposed local board engineers. A project of this magnitude would have been altogether beyond the capabilities of a district engineer. Apart from this, the road ran through a remote frontier district where no district board existed. It took a week to get there from Sadiya, the headquarters station of the North-East Frontier district which was itself under a political officer with no district board at all. The introduction of the proposed scheme into such a district would be impossible for several generations to come. The officer placed in immediate charge of the road was, as a matter of fact, entirely cut off from even the adjoining district headquarters during the rainy season. He did not think that, in the circumstances he had indicated the introduction of an agency other than that of the Public Works Department was feasible.

1,693. (*Mr. Mackenzie.*) Improvements had been introduced in the rules for the local purchase of stores, but a provision still existed under which the submission of reports and explanations was inevitable if articles

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other than those specified were obtained locally. This, the witness thought, was a restriction which could well be abolished. It was possible to effect a comparison in the prices of some of the stores obtainable in England and in India from the returns of the Railway Department, which specified the average prices paid. The Public Works Department was guided by those returns as a rule, and, in the absence of tests, it insisted on the supply of articles manufactured by certain recognized firms. The requirements of the Buildings and Roads Branch of the Public Works Department in Assam were not complicated, and if English-made girders of a particular make, for instance, were needed, there would be no difficulty in procuring them locally. Rolled steel girders were manufactured in India, but the firm which turned them out was at present requisitioned for war work. The existing rules for the supply of European stores were in his opinion too cumbrous and involved, with the result that an officer sometimes ran counter to one rule when complying with the requirements of another, and engineers were afraid to exercise the discretion given them under the rules.

1,694. Engineering appointments in Assam were not given to men belonging to the province, as they were trained at the Sibpur College. He considered it anomalous that Assam could not appoint its own Sibpur students because the Assam appointments were reserved by the Government of India for Roorkee men. Such appointments, he thought, ought to be earmarked for natives of the province.

1,695. He acknowledged however that the men recruited from Roorkee were good, and somewhat superior to those trained in other engineering colleges. The course of instruction given at Roorkee, including the practical course, was an excellent one, as good as that given in English colleges; but the supplementary departmental training which was at present given was essential. Men entered the Department as apprentices on a year's probation on a substantive rate of pay; and unless they were guilty of something very untoward they were usually confirmed in their appointments. The year's practical training given at present was not sufficient in his opinion, and he considered that an extended practical course of not less than two years would be both beneficial and desirable. During that period, he suggested that government might pay the students travelling expenses and a maintenance allowance of about Rs. 100 per mensem, and require them to submit note books to the heads of their colleges through their departmental officers. As an alternative he suggested a minimum of a year's training for every student, and an additional year for those who were well reported on. It would be a good thing if students were permitted to visit private workshops of firms which were agreeable to their doing so but he did not think a workshop training would prove as useful to them as a course of practical training on government works. The payment of an honorarium to the foreman who trained the students would act as an incentive to that officer to take pains in their training but he did not think that it should be needed in the case of Public Works Department Executive Engineers. When the witness was employed in the United Provinces there was a system in vogue for the practical training of overseer students by subordinates, and a fee was paid to the subordinates under whom students were placed for training.

1,696. (*Eai Bahadur Ganga Ram.*)—The witness stated that he was a Roorkee engineer and that he had spent the major portion of his service in the United Provinces. As an Assistant Engineer he went to England and qualified as an Associate in architecture. Later on he obtained the degree of F.R.I.B.A. which was the highest diploma in architecture obtainable. In the ordinary course of his work he had designed various buildings but had never actually held the post of Architect to the Government.

1,697. The majority of the buildings in Assam were made of timber, and brick buildings were comparatively few owing to the prevalence of severe earthquakes. Outside government there was very little brick manufacture in the Assam valley, and the public often pur-

chased the inferior bricks rejected by the Public Works Department.

1,698. Witness stated in answer to a question that if the Public Works Department was not required by rule to budget year by year for its requirements, it might be possible to give out contracts for road construction for a stated number of years and thereby enable contractors to advance money for labour, but the present restrictions regarding lapses did not admit of this.

1,699. His experience of the only European building contractor he had to do with in Assam was unfortunate, but he added that he could not on this single instance pronounce a definite opinion as to the capabilities of European contractors as a whole. He was not averse to giving a man of known capabilities a trial.

1,700. From a Buildings and Roads point of view there was no necessity for a Director General of Stores' office located either in Bombay or Calcutta. Executive Engineers, in his opinion, should be allowed a free hand in the purchase of stores in India. He met the contention that as a result of such power some Executive Engineers might possibly give preference to certain firms, by stating that an untrustworthy Executive Engineer ought to be dismissed. For the speedy execution of work it was essential that Executive Engineers should be given adequate power.

1,701. There were upper subordinates in Assam unfitted for sub-divisional charges, but such men were not given charge. He assented to the suggestion that government ought to be empowered to weed out the unfit.

1,702. He had not withdrawn his recommendation for a provident fund, but was willing to accept the recommendations of the Public Services Commission in so far as they related to officers already in the Department. It would be inadvisable to have one set of rules for the Buildings and Roads Branch and another for railway and irrigation engineers. The provident fund instituted for railways applied only to officers in the Traffic Department and not to those in the Engineering Department. He was of opinion that all government engineers, in whichever branch they were employed, should be treated alike, to avoid the possibility of invidious comparisons being made. The provident fund system was commendable, but the proposals of the Public Services Commission were adequate for the existing establishment. Both systems had their advantages, but under the pension system proposed by the Public Services Commission government would have a greater hold on their staff.

1,703. He admitted that the grant of authority to district boards to appoint their own engineers might result in a repetition of the failure with which the experiment had been attended in the United Provinces. He added, however, that the failure in the United Provinces was largely due to the fact that it was premature.

1,704. District engineers under local boards would not have bright prospects before them, and all that they could look forward to was a transfer from a smaller to a larger district.

1,705. (*Mr. Cobb.*) The reorganization scheme could not be applied to a large portion of Assam. It could only be introduced in the more advanced and prosperous provinces.

1,706. Tea planters were established all over the province including the more remote portions. They often formed the most important element in such districts, and furnished the useful members for district boards. They made an excellent agency for road repairs, when they could be induced to undertake them, being keenly interested in the roads and often their chief users. He considered that local boards with planters on their committees could be usefully entrusted with the execution of public works.

1,707. It was difficult to change the present procedure under which the Public Works Department laboured in respect to the preparation of projects, as the heads of other departments were entitled to call upon the Public Works Department to prepare estimates of requirements. The practice had resulted in the framing of an enormous number of abortive schemes, and it was one continuous struggle on the part of the Public Works Department to restrict the demand for projects to such as were likely to

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be carried out. In his opinion, there was no way of complete escape from this difficulty as each head of a department gave expression to his then ideas and these were often changed afterwards by himself or his successor, thus necessitating the preparation of revised schemes. But the difficulty of which he complained could be partially overcome by a rule that only such schemes should be put forward as had a reasonable prospect that the necessary funds would be forthcoming within that year or the year following. It might also be a good thing if in the annual administration reports credit could be given to the Public Works Department for the preparation of projects at 2½ per cent. for detailed schemes and 1 per cent. for rough schemes, thus bringing home in actual figures the waste of government money involved in the preparation of futile schemes.

1,708. The Sylhet church case was an isolated one but it showed the results of over-codification. He repeated that as the Code rules were framed for India as a whole they could not be made applicable to the varying conditions in all provinces. A reference to the Code would show that every page was crowded with standing orders issued in the constant vain effort to overcome this difficulty.

1,709. In Assam, owing to climatic conditions and the prevalence of earthquakes residences of government officials were mostly 'chang' buildings, i.e., wooden structures on piles. Buildings of this nature were naturally liable to decay and in the course of years required attention. Under the present rules the additional outlay thus incurred on residences was added to the capital cost of the building and a corresponding increase was made in its rent. Consequently the occupants complained of having to pay more rent for buildings thirty years old with rotten timbers and uneven floors than was paid when they were new. Questions of this nature were very difficult to deal with under the present inelastic rules.

1,710. The present standard of theoretic instruction at Roorkee was adequate, but instruction in certain specialized subjects might with advantage be added to the course. The class of students at Roorkee had deteriorated, owing mainly to the introduction of the provincial service and the consequent lowering of the status of the engineers recruited from that college. He added that if the prospects were lowered the same class of candidates could not be expected. The introduction of a course of architecture would be a decided advantage as some knowledge of the subject was required in the service.

1,711. There were no military engineers in Assam; hence all military works were executed by the Public Works Department on requisition from the military

authorities. A similar procedure was in force for the construction and repair of other imperial buildings such as post and telegraph offices. A charge of 2½ per cent. was levied for establishment employed on military and imperial civil works.

1,712. (Mr. Green.) Temporary buildings maintained by civil departments, such as Jails and Police, were erected by the civil departments themselves. As the province was poor and undeveloped, and as all these buildings were easily maintained and of a perishable nature, it was preferable that they should be left in charge of the departments concerned. This system also obtained in Bengal.

1,713. The witness here added that one point which he would like to emphasize was that if the Public Works Department was to be further decentralized and placed under a provincial Chief Engineer on whom the whole working of the Department would depend, that officer should be allowed a five years' tenure of office. Under the present fifty-five years' rule the Department often lost Chief Engineers when they were doing their best work. He illustrated his meaning by citing a recent case in the United Provinces of an irrigation officer who was in every way capable of carrying on, and had received special praise from the Lieutenant-Governor, but was compelled to retire, in the fulness of his experience and physical fitness, after little more than one year's service as Chief Engineer. Even in that one year he had performed excellent work and left his mark on the province. Such was the sort of officer, he thought, in whose case the 55 years' rule might with advantage be relaxed to the extent that such an officer might be allowed to hold the office of Chief Engineer for at least five years.

1,714. He then advocated the freer use of lump sum contracts in the case of smaller works, but where this was done, it was necessary to make sure that work had been done according to the measurements. A good deal of labour might be saved by estimating in detail but giving out the work on lump sum contracts instead of reproducing the estimate item by item in the tenders and bills. There was nothing against the adoption of such a practice; it was indeed partially followed already, but he considered that it might be followed to a greater extent.

1,715. He suggested that supplementary estimates might with advantage be substituted for revised estimates. At present if there was even a slight excess a revised estimate was necessary, and this entailed the preparation of a fresh estimate for the entire work and its re-writing. If supplementary estimates were more freely accepted for such excesses they would lead to a great saving in labour.

J. W. MEARES, Esq., M.I.C.E., M.I.E.E., Electrical Adviser to the Government of India.

Written Statement.

1,716. *The standpoint of the present writer.*—I am not a Coopers Hill engineer like most of my contemporaries, nor was I selected by the Secretary of State. I came to India in 1896, to carry out works for a private firm, after a works training, and college course and some years of employment in central station and construction work. In 1898, after 18 months in Calcutta and Darjeeling, I was selected by the Bengal Government as their Electrical Engineer, and subsequently, in 1904, I was transferred to the Government of India as their Electrical Adviser.

1,717. *Experience of administrative and executive branches.*—So far as the main trend of this inquiry goes, I am not in a position to speak dogmatically, as I have never held either a regular post (such as Under-Secretary) in a Secretariat, or an Executive or Superintending Engineer's charge dealing with the ordinary routine of the Roads and Buildings Branch of the Public Works Department. At the same time, on the analogy of the onlooker who sees most of the game, I can criticize even where I cannot suggest a constructive remedy; for I have had close relations with the Secretariats of Bengal, the Punjab and the Government of India, extending over

some 18 years, as well as with every grade of the service from top to bottom both in Calcutta and elsewhere. I have also officiated as Controller of Patents for over a year. I will deal with my own branch last.

1,718. *Personnel of the Public Works Department; seniority and selection.*—From this detached point of view I have been able to see certain defects in the Public Works system. In the first place it necessarily follows, when a number of persons are annually selected or appointed *in bulk*, on a certain scale of pay and with certain prospects before them, that some will turn out above and some below the average standard required and obtained. During their whole service the former will be underpaid and the latter overpaid, judging by the standard of their profession in civil life. The inefficient man, who in private employment would always be looking for a job, has only to keep quiet and rise as his seniors retire; occasionally he attains to the rank of Chief Engineer of a province, with results which can easily be imagined. Throughout the whole cadre there is too little selection and too much assumption that seniority of service is the best criterion of ability. A man may be an excellent executive officer but useless in an administrative post, and *vice versa*.

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1,719. *Business training.*—The great majority of the Public Works Department officers have naturally had no business training at all. If they had to earn their living in a commercial capacity for a year or two, before being appointed, the service would benefit immensely; any business run on the lines of the government departments, where the simplest letter takes from 3 weeks to 6 months to answer, would be wound up within a year. The head of a large Calcutta firm will have a score or more of businesses to control, with large financial interests at stake. Can he be imagined sitting surrounded by over 50 huge files, each with a red "Urgent" slip, for weeks on end? Yet this has happened within my experience. Would it pay him to leave all his current letters—matters perhaps of a minute or two—while he spent day after day on a case that really involved lengthy consideration? Were he certain of a pension in a few years it would be immaterial; but not if that pension were the one reserved for indigent paupers. What is known as the "government stroke," when applied to dockyard hands, is by no means unknown in the higher walks of government service. I realize that it is important that government should act deliberately, so as to avoid making blunders; that it is necessary to docket papers very exactly for subsequent reference; that a question affecting more than one department must be examined by each. But I think that in many more cases than at present an *ad interim* reply beyond a bare acknowledgment; or a conditional reply subject to confirmation; or a partial reply, to be supplemented later, could be made to business communications without endangering the fabric of government. The old system of noting, wherein several clerks solemnly and successively paraphrased the whole letter under consideration, was mitigated some time ago. Cannot some further steps be made in the direction of business treatment of correspondence?

A business friend recently wrote to me "From a business point of view an irritating feature of government departmental control is the constant change of *personnel* which ensures most thoroughly that the heads of the various departments know as little as possible of the subjects referred to them. In one big scheme in which we are interested there have been no less than 25 separate changes in the head of the particular department during the last 18-20 years, with the result that we are really not much more advanced to-day than we were in 1898, and this is a matter of imperial interest. Unfortunately, it is such a big subject that the sole object of the various heads of departments before whom it has come has been to delay it until their time was up, and so save themselves the trouble of dealing with a very big and important subject."

1,720. *Public Works Department subordinates and minor works.*—I have had comparatively little to do with the lower subordinate, who is necessarily the pivot on which the Public Works Department turns in the matter of minor works. It would appear to an outside observer that his business is to superintend the contractor who looks after the minor sub-contractor; while the ranks above are engaged in looking after *him*. It is a case of "greater fleas have lesser fleas." I keep in touch with a good many engineers in private firms, however, and if they will tell what they know (which is perhaps unlikely) I think it will be in the direction of desiring "an improvement in the class from which the subordinates of the Public Works Department are drawn." In justice to the class, however, it may certainly be said that the same *desideratum* applies to subordinates in private firms and companies. Probably the remedy lies in better educational facilities, but this is outside my province. My only experience in that matter has been as a special lecturer at Sibpur College on two occasions and as an examiner in electricity to Roorkee some years ago. I saw room for much improvement.

1,721. *The Public Works Code.*—I have not been troubled much by the Public Works Code personally, but I believe it ranks next in importance to the Bible and the Civil Service Regulations. The net result is necessarily

a stern discouragement of common sense in favour of action by rule, except in the case of officers of high enough standing to insist on business methods. I cannot suggest a remedy. Where the technical rules I have to administer conflict with common sense I follow the latter, until I can get the rule amended, and take my chance. I believe that most of the provisions of the Code are totally unsuitable for the work done by government Electrical Engineers, in so far as they apply to such matters as measurement books, completion reports and plans, etc. The provisions of the Code were drawn up for works such as buildings and excavation; and the forms and methods of procedure, while suitable for such work, cannot properly be used for electrical work. In some provinces these forms are not used, but in others the Accountant-General insists on them, as being in accordance with the orders of the Government of India. I recommend that the use of unsuitable forms be discontinued.

I have been asked "whether the Accountant-General is the result of the Public Works Department Code or whether the Code has emanated from the Accountant-General's Department." My correspondent adds:—"It is to my mind the Accountant-General who is the paralyzing influence in every government department, and it is quite impossible to strike out in a new line or depart from the hoary practices without coming in immediate and peculiar conflict with this gentleman." My personal experience has been with the Comptroller of India Treasuries, both as Electrical Adviser and as Controller of Patents; but these remarks apply to that office also, in my opinion.

1,722. *Progressive methods.*—It is a truism that pushing men with new ideas are "taboo" in government service; they cause trouble to their superiors, and are only suitable for business. They seldom get on. I remember the cry that arose when the installation of telephones in a certain Secretariat was suggested; and I believe that typewriters were only introduced into another Secretariat when it was found that the then Viceroy, visiting that distant province, would not read papers in manuscript. I merely cite these as ancient examples of a spirit by no means dead. In my profession plant quickly becomes antiquated; advances in efficiency have been achieved such that, by scrapping machinery only a few years old, the money will be saved in fuel economy or increased output in a few years. The American engineer designs his plant with one eye on this fact: the British engineer is now beginning to see that there is something in it: but the government department, all the world over, prefers to wear out the old before introducing the new. As with plant, so with methods. It may be palpably false economy, but it shows a budget saving. The whale may be a practical certainty, but the sprat has to be paid for.

1,723. *Selection of officers.*—I have no knowledge as to the method of selection of officers for the Public Works Department generally. I was, however, once deputed to select, in consultation with the India Office, an Electrical Engineer to take charge of a power station. It would hardly be wise to commit to paper what I then gathered of the method in vogue: I had previously wondered why totally unsuitable men had sometimes been sent out to fill posts of importance, but I wondered no longer. In the past manufacturers have sometimes sent plant to India which they could not dispose of at home; possibly some employers look upon India similarly as a dumping ground for unsaleable goods.

1,724. *Inter-departmental relations.*—I would like, before proceeding to deal with the personal side of the Electrical Branch of the Public Works Department, to make a few remarks on the relations between different departments as they strike an outsider who has some inside knowledge. In the first place my branch is, I would emphasize, a branch of the *Public Works Department*, and in no sense of the Government of India. The title—and presumably this applies also to the other sub-divisions mentioned in paragraph 2, clause (c) of the resolution—implies that the officer serves the *Government of India*; but there appear to be some ten Governments of India, not one

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Government of India; as well as some 14 local Governments all of whom collectively administer the government of the real India. Sometimes I cannot help thinking of the administration as a solar system in which the central force of gravity has weakened to the danger point. That blessed word "decentralization" has become a fetish. In my own branch of the service there is urgent need of greater uniformity of specifications, etc., and of action in particular circumstances by the officers concerned; this has been urged upon government and upon me, by public bodies and business men, but some local Governments and some of their officers decline to see eye to eye with the Government of India or myself as the case may be, and the Imperial Government has no more power to enforce its views than I have. Small wonder then that the mere business man, with a project in his pocket and capital at his back, is puzzled as to how to proceed.

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1,725. *Personnel of the Electrical Branch.*—Leaving questions of general administration, I now come to my own branch of the service. This consists of:—

- (i). The Electrical Adviser to the Government of India.
- (ii). Electrical Engineers to Government in certain provinces.
- (iii). Electric Inspectors in most major provinces.
- (iv). Executive Electrical Engineers in certain cities.

The functions of (ii), (iii) and (iv) are sometimes combined in one officer, whether under a single title or more than one. Each of the provincial officers has the duty of advising his own government in electrical matters within his particular sphere. They correspond when they choose with the Electrical Adviser; but they are in no way bound to follow his advice. Their work, except in the case of executive officers, is mainly concerned with the administration of the Indian Electricity Act, 1910, and the rules thereunder; it covers the operations both of companies and local authorities licensed (or seeking to be licensed) to supply electricity to the public, and also those of factory owners and others who have their own installations.

1,726. *Electrical legislation.*—The Indian Electricity Act of 1903 was repealed and re-enacted in 1910, after 7 years' experience of its working, and the Government of India were then in favour of more centralized control; in this matter they were strongly supported by the Bengal Chamber of Commerce, which had far more experience than any other public body in the matter. The Bill drafted on these lines was however decisively negatived by the Secretary of State, and a modified Bill met the same fate. Personally, I am convinced that the Bengal Chamber of Commerce was right, and the Indian Mining Association, I believe, agreed with that body; but as the matter is *res judicata*, and as I should perhaps have benefited personally by the change, there is no more to be said directly on the subject. This much, however, it is necessary to remember in any discussion as to the Electrical Branch.

1,727. *Duties and functions of the Electrical Adviser to the Government of India.*—The duties of the Electrical Adviser "in relation to the local Governments and Administrations and public bodies" were recently set forth in a revised form, in Circular No. IV-Public Works, dated 18th June 1916; with annexed rules as to duties and procedure. I have no further comment to make on these rules than that they are as satisfactory as the circumstances explained in the previous paragraph admit. A copy * is attached to my covering letter.

(2). With the Government of India, the duties of the Electrical Adviser are to advise on all electrical matters which come to the *Public Works Department*. These are to a considerable extent of a legal nature, and commercial and technical matters make up the balance. As already explained in paragraph 1,726, local Governments administer nearly all the provisions of the Act, so that

many important matters do not necessarily come to the Government of India at all, still less to the Electrical Adviser to the Public Works Department. So far, however, as cases which do come to the Government of India are concerned there have been great improvements within the last year, as the reconsideration of the Electrical Adviser's duties enabled him to point out some of the defects in the system, and to obtain a hearing previously denied to him.

(3). It would seem desirable, in the interests of the trade of India—out of which the Government of India arose, and through which it is still chiefly in existence—that before proposals of commercial firms dealing with electrical projects, and involving large expenditure, are negatived, the Electrical Adviser should be consulted. So far as the Public Works Department of the Government of India are concerned this is now the case, though it has not always been so. It is probable however that some of these large commercial cases are dealt with by the Military Works Department (*e.g.*, in cantonments) and by the Commerce and Industry Department. Certainly many of them are dealt with by local Governments. In Native States political officers have also had to deal with questions such as the value of natural water-power, which are hardly within their province.

1,728. *Provincial Electrical Engineers and Electric Inspectors.*—Attached to this memorandum is a complete list* of the officers in charge in the Electrical Branch of the Public Works Department, with particulars of their pay and conditions of their appointments. Omitting the names in brackets (*vide note to Table*) the average age on appointment is 30 years. Of the provincial officers, omitting those in brackets and officers only officiating, the average pay is minimum Rs. 660 *per mensem*, maximum Rs. 900 *per mensem*.

(2). It will be seen at once that the Electrical Adviser was given better terms than any of his colleagues; and that the conditions of service of the latter are somewhat chaotic. All these officers have in 1915 collectively urged on government "that it is desirable that there should be uniformity in regard to the conditions of employment of the various Electrical Engineers and Inspectors in government service, and that such conditions should not be less favourable than in the case of other officers in imperial service."

(3). It stands to reason that there are differences in the qualifications, etc., of the officers in the branch, due to their education, training, length of experience and natural ability; but it is somewhat anomalous that individually selected specialists, mostly appointed at a ripe age (from 25 to 35), should be less favourably situated than the corresponding members of a service selected in bulk and trained mainly after appointment. Either these specialists have been treated according to merit, in which case the method of selection must clearly have been faulty; or, in the alternative, their lack of cohesion in their isolated positions, as a service without a head, must have prevented them from getting terms to which by analogy they are entitled. My own opinion favours the latter alternative, as the pay of the regular Public Works Department service has risen greatly in the last 15 years.

(4). Just as to average people an analytical or agricultural chemist is associated with a shop, and an engineer with the driving of an engine, so is the electrical engineer confused with the plumber and gasfitter who puts in bell wires. Occasionally the comparison is justified, but that is the fault of those who select unsuitable men. The great majority of Electrical Engineers are of the gazetted officer stamp, and in India this is a matter of daily growing importance.

1,729. *Comparison of electrical officers with others holding similar appointments.*—The Public Works Committee will no doubt have before it particulars of all the special services mentioned in the resolution, and presumably of similar services under other departments. I cannot obtain full particulars, and I do not wish to select cases that I know are favourable to my argument while omitting

* Not printed.

* Not printed.

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[Continued.]

others that may not be so. I will merely mention, without any details, such official posts as appear to correspond more or less closely with those of my branch, and I ask the Committee to complete the comparisons in respect to the detailed columns in my table. I venture to predict that there will be found a complete lack of system and uniformity, and that the electrical specialists will be near the tail of the procession.

PARALLEL TO ELECTRICAL ADVISER.

Government of India—

Agricultural Adviser.
Chief Inspector of Explosives.
" " Mines.
Consulting Architect.
Director, Geological Survey.
" Botanical Survey.
Superintendent of Stamps and Stationery.
Chief Engineer, Telegraph Engineering.
Conservators of Forests.
Directors of Surveys.

And, to a less degree, Inspectors-General and Directors-General.

Local Governments—

Superintending Engineer, 1st Class (to which class E. A. nominally belongs; see paragraph 1,731).

PARALLEL WITH ELECTRICAL ENGINEERS AND INSPECTORS.

Senior Inspectors of Mines.
Superintending Engineer, Public Works Department (Seniors).
Executive Engineers, Public Works Department, 1st Class (Juniors).
Sanitary Engineers to local Governments.
Directors, Telegraph Engineering (Seniors).
Superintendents, Telegraph Engineering (Juniors).
Chief Electrician, Telegraphs.
Superintendents, Geological Survey.
Consulting Architects to local Governments.
Chief Inspectors of Factories.
Assistant Director General of Forests.

1,730. *Working proposals for reorganizing the Electrical Branch.*—In my opinion, and I think I speak for all my colleagues also, the following conditions should apply to the members of the Electrical Branch:—

- (i). Service to be on *permanent establishment*, after a period of probation (say, 3 years), which should be allowed to count. Status and pay as in succeeding paragraphs.
- (ii). *Non-pensionable.*—The officers are mostly not appointed young enough to earn a full pension under the ordinary rules.
- (iii). *Special provident fund.*—Similar to that given on state railways. A few officers now have this; *vide* table. (The general provident fund offers the minimum of advantage.)
- (iv). *European leave rules.*—For officers trained in Europe, whether appointed in England or in India. (When possible it is obviously advantageous to appoint, in India, men of home training and education, who have already some experience of this country and its business.)
- (v). Officers appointed when over 26 (?) years of age should be able to claim some furlough after 5 years' service, instead of after 8 years, especially when they have already served in India. The Civil Service Regulations, like the Public Works Code, were drawn up with one set of conditions only in view, namely, for men who come out to India to join government service at the *beginning* of their careers. Men who join much later in life should certainly not be penalized, as regards furlough, when compared with men of their own age and length of residence in India.

1,731. *Proposed status and pay of Electrical Adviser.*—The Electrical Adviser should be appointed with the status and rank of a Superintending Engineer, as was the case with myself; but his minimum pay on appointment should also in future be the pay of a Superintending Engineer, 3rd class, *viz.*, Rs. 1,500. He should receive an annual increment of Rs. 50 and the status, precedence and rank of Chief Engineer after 15 years' service. His pay will then, on this scale, be Rs. 2,250; after 20 years' service it will be that of Chief Engineer, 2nd class, *viz.*, Rs. 2,500, and this should be the ordinary limit. The pay would be consolidated, and without presidency allowance, exchange compensation or house rent, as at present. The value of these allowances is generally overlooked, I notice.

(2). My own pay only rose to that of a Superintending Engineer, 3rd class, after 10 years' service; it is at the maximum now, *viz.*, Rs. 1,600. Superintending Engineers, 2nd and 1st class, draw Rs. 1,750 and Rs. 2,000. In order to make this anomaly perfectly clear I would quote sub-head (4) of paragraph 2 of my letter of appointment, No. 13-G., dated 5th January 1904, "as his maximum pay will correspond to that of a Superintending Engineer, 1st class, his status will be that of a Superintending Engineer and he will be entitled to travelling allowance and precedence of that rank." In the Warrant of Precedence, Superintending Engineers, 1st class, come in No. 69; but the Electrical Adviser is relegated to No. 73, and *below* "Sanitary Engineers, not being Superintending Engineers."

1,732. *Proposed status and pay of provincial officers.*—In my opinion, and here I speak without personal bias, the best arrangement in the remainder of the branch would be to have three grades (excluding subordinates). The titles will depend on whether the officer's work is advisory (Electrical Engineer) or statutory (Electric Inspector) or both. In connection with pay it must be remembered that these officers always live in capital cities, but do not draw any exchange compensation allowance, presidency allowance or (I believe) house rent. (For special allowances in certain cases see table.) Being non-pensionable, they are directly comparable with men of their profession in civil life, but they are much worse off. Government should have the pick of specialists, but to get this they must pay the market price.

- (a). Electrical Engineer (or Inspector), 3rd class, appointed on Rs. 700 to Rs. 950 according to qualifications, rising by annual increments of Rs. 50 to the maximum when appointed on any lower pay than the maximum. Status to be that of an Executive Engineer.
- (b). Electrical Engineer (or Inspector), 2nd class. Officers of the 3rd class to be promoted to this class on Rs. 1,000 the year after they arrive at Rs. 950. Officers newly appointed to the class to begin on Rs. 1,000, rising by annual increments of Rs. 50 to Rs. 1,300. Status to be that of an Executive Engineer, 1st grade.
- (c). Electrical Engineer (or Inspector), 1st class. Officers of the 2nd class to be promoted to this class on Rs. 1,350 the year after they arrive at Rs. 1,300. Officers would not ordinarily be newly appointed to this class, so far as one can foresee, but the pay would begin on Rs. 1,350 and rise by annual increments of Rs. 50 to Rs. 1,600 maximum. Status to be that of a Superintending Engineer.

1,733. *Further points.*—Some, but not all, of these officers are already appointed with a liability to transfer to any province; but at present this seldom occurs, because there appears to be no way of arranging such transfers. One local Government cannot transfer its officers to another province; only the Government of India could do this, and it has no power to do it at present. There is also no spare officer available, owing to the smallness of the service. To obtain full efficiency it must be the ordinary practice to transfer the *best* officer available (not necessarily the *senior*) to a vacancy occurring in a

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higher class. This should apply to long leave vacancies also; at present these are sometimes filled up by subordinates quite unsuitable for gazetted posts. Some provinces will, for some years to come, be able to manage quite well on a third-class officer. If, however, the officer is good enough, he should be transferred elsewhere in a higher class, as opportunity offers, and the vacancy filled by a new man of the 3rd class. To make this system work properly it seems essential that the Government of India should have the power of posting or transferring all these officers, but otherwise they should be entirely under the orders of their own local Governments.

Mr. J. W. MEARES, called and examined.

1,734. (*President*.)—The witness stated that he was the Electrical Adviser to the Government of India, and that he joined Government service as Electrical Engineer to the Government of Bengal in 1898. He had been trained originally for three years at Messrs. Crompton's works, and had sandwiched in a year at University College, London. He had been employed on various works for his firm for about three or four years before coming out to India, as well as on central station works and works connected with the erection of machinery. He had taken no university degree, but was a full Member of the Institutions of Civil Engineers and of Electrical Engineers.

1,735. He had no statutory functions under the Indian Electricity Act, and was purely an advisory officer. When employed in Bengal he had statutory powers, but since coming to the Government of India his duties had been entirely of an advisory nature except when he had officiated as Electric Inspector in the Punjab and in the Delhi Province temporarily. He had no statutory powers under the Indian Electricity Act, and only advised on cases in which he was consulted. There was a provision for appeal to the Government of India under the Act, but very few cases had been referred to such authority, as local Governments did not like interference from headquarters. Many cases arising under the Act had been submitted to him for advice by local Governments, who were allowed to consult him direct, through the medium of demi-official correspondence, unless the case was one which was likely to require an official reference to the Government of India. Such cases were received both from local Governments and from the local Electrical Engineers, except in the case of Bombay the government of which presidency had prohibited their Electrical Engineer from corresponding direct with him. He generally had three or four large cases on hand, some of which meant weeks of work and long reports, as well as minor references. He added that until about two years ago his post had been a sinecure. Latterly, however, he had had a good deal to do, as a conference of Electric Inspectors and Electrical Engineers had been started which threw a good deal of work upon him throughout the year. All his work was technical and could not be done by his clerical establishment, who merely kept records and typed.

1,736. He possessed no statutory or non-statutory functions under any Act, nor had he any official powers connected with them. He had kept himself in touch with the Chief Inspector of Mines, who consulted him unofficially in matters involving electricity.

1,737. In the Government of India, till the last three or four years, he had only been consulted in projects which were received in the Buildings and Roads Branch of the Public Works Department, and had had nothing to do with projects received in other departments, or even in the Irrigation Branch of the Public Works Department. Now, however, most of the cases which were referred to the Government of India in the Public Works Department from other departments, and were even remotely concerned with electricity were referred to him.

1,738. There were certain restrictions on the powers of local Governments to sanction electric projects, and in certain cases the money limits involved were beyond the local Government's powers of sanction. Such cases were occasionally referred to the Government of India and he

2. I may also add that while I myself and some others come under the ordinary rules of the Civil Service Regulations as regards private work, the majority of the officers concerned are debarred. In my opinion, every officer in the Public Works Department should be freely encouraged to do private work, so long as it does not interfere with his official duties or with private consultants. It would keep them in touch with the realities of their profession, and thus react to the good of their employers; and it would enable government to gauge their real—i.e., their commercial—value.

had been consulted on them. Officially speaking, he was totally ignorant of commercial projects, and had very seldom been consulted by the Government of India in such cases until recently; hence all that he had learnt about these was from private sources. They really represented a very important branch of his work, however, as it was his endeavour to help such projects towards success.

1,739. He admitted that the work of his office decreased after the appointment of local Electric Inspectors, as they had relieved him of much of the work with which he used to deal, with the result that for years together until the last three years he had had very little work; but the question had then been examined by the Government of India at his instance and he had now sufficient work to do. The increase of work within this time was due to the fact that he had kept himself in touch by direct correspondence, with Electric Inspectors in other provinces.

1,740. He also went on tours during which he saw construction in progress, and commercial works in operation, and he took the opportunity to consult the people interested. When he visited headquarters stations the local Governments invariably had some cases pending, generally three or four in each province, on which they desired to consult him—e.g., a water-power scheme, or some other such large project in which a second opinion or a consultation was desirable. The real value of his office lay in such consulting engineer's work, where experience of the whole of India was of great value. His tours were not tours of inspection, and in fact he was prohibited from making inspections except by request and was only allowed to visit places and advise. He could officially inspect a work only at the request of the Chief Engineer of the province. He kept his own notes, however, and if he discovered that there was anything wrong he was allowed to send a memorandum to the Chief Engineer, as distinct from the local Government, pointing out the defects noticed. He had been given general permission by local Governments to visit all provinces, except Bombay, in the case of which presidency he was required to obtain the special permission of the local Government before he made a visit.

1,741. It was part of his duties to advise municipalities and local bodies, if they chose to consult him. They, however, very seldom did so as most of them were ignorant even of his existence. As to whether he was ever consulted by these local bodies in preference to their own experts he stated that the Ootacamund and Darjeeling municipalities had recently asked his advice on a number of rival water-power schemes, but such cases were very few, and that it was probably a matter of convenience rather than preference, or in some cases a matter of a second opinion. He had carried out water-power works.

1,742. He was not prohibited, under the Civil Service Regulations, from taking up private practice, but he had undertaken very little work of that nature. In his younger days he had had a good deal of private work, but now he very seldom undertook it. He was on his way to Hyderabad where he was going, at the request of the Nizam's government, to advise on the prospects of an electrical company, and the work was of private nature. He had had no research or investigation work, and had no laboratory for the purpose.

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1,743. He complained of excessive decentralization in the Department, but explained that he was not against decentralization in general of which he was rather a supporter. He considered, however, that it had been carried too far. Electricity was a new industry, which was working its way up, and he thought it was immensely to the advantage of the country that it should be made a matter of imperial interest. It was lamentable that it had been decentralized, in technical matters, in opposition to the expressed public opinion of Calcutta businessmen. One of the faults of the present system was the lack of uniformity in specifications, interpretation of rules, etc. He admitted, however, that specifications should not be rigidly uniform, and that small differences should be allowed on account of climate and local conditions. A deputation of contractors had attended the electrical conference in Calcutta and had brought with them a table showing the differences in specifications in three provinces. Not a single alteration from the original form appeared necessary, but as a result the changes made had led to chaos. The conference had agreed that there was absolutely no necessity for most of the changes which had been made and agreed which of the divergent forms should be retained. On the other hand he realised that there must be slight differences in specifications on account of local conditions, e.g., work in the hills was quite different from work in the plains, and work in the Punjab different from work in Bengal.

1,744. He complained of a lack of uniformity of policy in regard to electricity, and that sufficient encouragement had not been given to company undertakings financed by private capital. Every province had its own methods, and in some provinces companies were treated as if they had been started only to rob the public. He was of opinion that technical centralization in the Department would greatly encourage such undertakings, and he was certain that this was the opinion of the existing companies.

1,745. One of the chief difficulties in this connection was in the appointment of men to the Electrical Branch. Most of the men were temporary, and were kept on as such from year to year, and being temporary were afraid to assume responsibilities. He had constantly received cases which showed that the rules under the Indian Electricity Act were considered as sacred and were enforced where there was not the slightest necessity for so doing. He suggested that service in the Electrical Department should be made permanent after a period of probation, considering that the appointments of Electric Inspectors in India were all essential and that the necessity for each of them had been fully established. In fact, he thought that the Department was rather under-staffed. He preferred a provident fund, on the lines of the state railway funds, to a pension, considering that the former was infinitely better than the latter in every way.

1,746. Under the pensionable system, if a man died when he was 56 years old, he drew his pension for only one year, whereas if he were under a provident fund scheme there would be sufficient provision for his widow and children. This was, however, his personal view and he did not speak on behalf of his colleagues. Leaving himself out of the question he complained that all the men in the Electrical Branch were poorly paid. They were among the best men in the country and the best of them were as good as any of the civil engineers. With reference to the remark in his written statement that the Electrical Adviser to the Government of India should be the head of this department and should have the status of Chief Engineer, he stated that his intention was rather that if the incumbent of the post were a fit person he should be able to rise to the position of Chief Engineer because of the importance of his work as a consulting engineer to government. He admitted, however, that at the present juncture the nature of the duties did not justify the conferring of that status on the Electrical Adviser to the Government of India, if the criterion taken was the annual expenditure and the magnitude of the works carried out by a Chief Engineer in the Public Works Department; his work however was of a totally different nature and the Government of India recognized its value when the proposal was made to abolish a number of posts

of Inspector General and the like. If, however, he were able to direct things in the same way as the Director, Geological Survey of India, or the Inspector General of Irrigation, and be in an analogous position, it would be much better for India. Asked whether the Department should be taken away from the control of the local Administrations, he stated that he had merely mentioned what might have been done originally, but saw no hope of this being done now. It was a counsel of perfection to suggest upsetting the present arrangement. Even then he justified the giving of the status of Chief Engineer to the Electrical Adviser to the Government of India on the ground that if his advice was worth it, he should be paid accordingly. There was work enough for him, but it was not always given to him.

1,747. He considered that if the men in the Electrical Branch were satisfactory they should be put either into a special service, or brought on to the Public Works Department cadre according to the length of their experience. Asked why government should pay more when they could recruit satisfactory men on the existing rates of pay, he replied that these men had no collective voice, and could not make themselves heard, with the result that they could be obtained at a lower price. He contended that the men recruited for the Electrical Branch were mostly of the same stamp as those recruited as civil engineers.

1,748. He advocated a system under which there should be a permanent staff transferable from province to province. Transfers should, however, not be made unnecessarily. At present, the drawback was that when a gazetted officer went on leave a subordinate was put to work in his place. This should not be done, and if transfers were made from province to province a suitable man could be appointed in the vacancy. He admitted that there would be a danger if these transfers were made too often. The advantage of the system, however, would be that a man transferred from one province to another would be able to see the difference in work in different places and thus gain wider experience, rendering him more useful later on.

1,749. He had suggested three grades of officers rising up to a pay of Rs. 1,600, and explained, with reference to his suggestion that these men should be given similar rates of pay to those of the other members of the Public Works Department, that he had put that proposal before the Public Services Commission, and as it had not been approved or even referred to in the report of that body he had now put forward an alternative scheme. It was for government to consider which should be accepted. He was of opinion that a capable Electrical Adviser to a local Government should be of the same status as a Superintending Engineer, provided the officer were fit to hold that position, but this status should not be conferred as a matter of course. Asked whether there was any appointment of Electrical Engineer under a local Government equal in responsibility and work to that of a Superintending Engineer, he cited the case of the Electrical Engineer in Delhi who could rise up to Rs. 1,500. He considered that the work that this officer had done was as important, from the point of view of the Government of India as that of any civil engineer, and that his work and responsibilities were no less than those of a Superintending Engineer and far more useful. He admitted, however, that this was a special case and that government worked on averages and took its chance, but maintained his opinion that government should obtain the best men for its work and pay them well.

1,750. The maintenance of electrical installations, and a great deal of construction work also, had been done departmentally in Bombay. In Bengal, however, it had been executed through contractors. In India there were not a great number of contracting firms which could be entrusted with electrical work, but none the less in his opinion the system of getting electrical work done by contractors was the better. There were special reasons in Bombay for departing from this practice, but in Calcutta the contract method was undoubtedly preferable. He admitted it would not be feasible in other places as there were very few electrical contractors outside Calcutta and

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Bombay. One firm however had a branch at Delhi, and some at Madras and Rangoon.

1,751. The operation of the rules in regard to the local purchase of stores was more restrictive in the case of the Electrical Branch than in that of other branches, as there were electrical firms in India which could supply all that was required. He thought it would be infinitely better to buy things from local firms representing home firms as articles could then be tested in the country before payment was made, and, in the event of their being unsatisfactory, payment of the bills could be withheld. In obtaining stores through the Director General of Stores the difficulties lay in the facts that that officer supplied what he chose and that the tests made in England were useless. He could say from personal experience that the India Office tests were exceedingly perfunctory.

1,752. The question of having a system of licensing for electrical contractors, foremen and wiremen had been considered at the electrical conference. The conference had come to the conclusion that something in the way of licensing was necessary, but it was not unanimous as to how it should be done, and contractors did not agree with the local electrical officers. Certain fire insurance companies had petitioned the Viceroy, through the Government of Bombay, that some system of licensing should be introduced and the question was now under the consideration of the Government of India.

1,753. He had had experience of one student of the Sibpur College whom he took as an assistant when he was in Bengal. The latter was now in independent charge in Bihar and Orissa. He had not gone fully into the system of instruction followed at Sibpur, but had lectured there on occasions. The theoretical training imparted there was very good, but the main difficulty with all the Indian colleges was that the men could not get works training, which was absolutely necessary in the Electrical Branch, even more so perhaps than in any other branch of engineering, except mechanical, as there were no manufacturing workshops in India. It was essential that this training should be in manufacturing works, and he did not think that training on electrical installations was of much practical use, preferring training in railway workshops to the latter. It would be best, of course, if the students could have both. The main complaint was that Indians and country-born Europeans were unwilling to work with their hands.

1,754. (*Mr. Cobb.*) The visits which he had made to the provinces were quite voluntary and had been initiated by himself; he admitted that he had had a very considerable amount of leisure in the past. He ran the electrical conference and was the leading spirit in it. The conference had this year discussed eighty-five questions and did a lot of useful work. He admitted that he had had very little to do about three years ago but stated that he was now becoming useful again. The conference was now a recognized institution and the Government of India had agreed to its being held annually for the next five years. It enabled the Electrical Engineers to make their voices heard on technical questions. The public had been invited and their views obtained. In this way the conference had been doing a useful work which he hoped would continue even if he himself left the service.

1,755. He considered that Electrical Engineers who had joined government service would have been better off if they had joined commercial firms. Personally, he thought he had made a great mistake in joining government service. He had done so in the belief that he had considerable prospects before him. The engineer who had taken his place in his old firm was now the senior partner in India of that firm.

1,756. (*Rai Bahadur Ganga Ram.*) He had been recruited in India with the status of Executive Engineer for the first electrical appointment which was sanctioned, but had never been in charge of a division.

1,757. The conferences were held under the orders of the Government of India, and local Governments and Chambers of Commerce were invited to send representatives. The functions of the conference might, he thought, usefully be extended to the granting of the

suggested licenses to wiremen, etc., but he did not favour conducting of examinations by it on the lines of the Institute of Electrical Engineers in England. It would be better, he thought, to leave that class of work to technical institutions and colleges.

1,758. Indents for the purchase of stores were not submitted through him unless the stores were intended for the Government of India, although it was possible for a department to indent for an obsolete instrument, since electricity was a rapidly developing industry.

1,759. In his opinion, it would not be advisable at present to create an electrical department with officers of the status of consulting engineers, giving such officers retaining fees and allowing them to take up private practice, as he did not think there would be enough private work for such men. There were, at present, only about twenty or thirty licensed electrical undertakings for public supply in India. The best class of men was required for government works, and the private practice available would not be sufficient to attract them. He thought it would be a good thing, however, to allow both civil and electrical engineers to take up private practice. In some of the mechanical engineering colleges in America he believed that the professors were liable to dismissal if they were not able to earn specified sums by private practice.

1,760. (*Sir Noel Kershaw.*) With reference to the remark in his written statement that the duties of the Electrical Adviser were to advise on electrical matters which came to the Public Works Department and that these were to a considerable extent of a legal nature, he explained that though he had joined the Department as an engineer he was now more of a lawyer. He had drawn up both the Indian Electricity Acts and had assisted the Legislative Department and the Council in putting them into final shape. He had also to decide questions involving the legal interpretation of that Act, with the help of the Government Solicitor, which was a very heavy part of his work, and to deal with agreements for water-power, etc. In this way he had had a good deal of legal work to attend to.

1,761. He had to advise municipalities when they chose to consult him, but the matter rested entirely with the provincial governments. He thought that there should be some uniformity in procedure. There had been three or four cases lately in which agreements were irregularly drawn up by a legal officer who appeared to have no acquaintance with the Indian Electricity Act. He had long been aware of these facts, but could not himself ask the local Governments to consult him. He had brought the matter to the notice of the Government of India, which had only last year written a circular letter to local Governments suggesting that it might be desirable for them to consult the Electrical Adviser in such matters. There was a "model form of license" appended to the rules under the Act which had been used generally but sometimes modifications in it were necessary. He had drawn attention to this matter, but only lately had been able to obtain a hearing. Formerly, he had not even been permitted to make a suggestion, and when he did so was told that he should only give advice when he was consulted. He had, however, persisted in making his suggestions, and the circular referred to had been issued. He was now in a better position, and could submit notes for consideration to the Government of India.

1,762. (*Rai Bahadur Ganga Ram.*) When the Indian Electricity Act had been drafted, it was circulated to local Governments who had forwarded to the Government of India the opinions of their technical advisers, which had proved of great use.

1,763. (*Mr. Green.*) He pointed out that certain licenses and agreements were not in proper form and that they would create great difficulties after a lapse of years. He thought it would save a great many mistakes if all such cases were sent up to him. It would be better if these were sent to him unofficially, rather than to the Government of India. As he had constantly to deal with

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such questions, he was familiar with all the intricacies connected with licenses. In Bengal, however, there was

at present an Electrical Adviser who could deal satisfactorily with all these questions.

J. ZORAB, Esq., Superintending Engineer, Public Works Department.

Written Statement.

1,764. (General.) As the main intention of the Government of India is to replace departmental by private agency, I assume that these changes will apply only to presidency towns, as competent private agencies do not exist in the *mofussil* or small towns, and Calcutta firms would not undertake small works in the *mofussil*.

1,765. (L) Economy and suitability of methods of execution of public works.—All civil works are at present carried out in Calcutta in the following way :—The plans and estimates are prepared departmentally and the work is carried out by contractors at tendered rates. No work is done departmentally. The materials supplied by the Department are (1) bricks from our brickfields at Akra ; (2) steel-work obtained by indent on the Secretary of State or purchased locally ; and (3) sometimes cement and paints and *surkhi*. To help small contractors we purchase lime as well.

(2). In my opinion, the present method could not be improved on. The soundness and rapidity of execution of government buildings are well known, but some critics maintain that they are costly and could be more cheaply carried out by large contracting firms. The truth is that we do not care to erect cheap buildings as we have to maintain them and the cost of maintenance is high. It is really cheaper to erect a sound building at a higher cost and spend a trifling sum annually on its maintenance. Of late years many hostels have been built by private firms in Calcutta, and as government grants are made the plans and estimates are sent to me for check. I have invariably noticed that their rates are higher and that they use steel joists of light section resulting in the sagging of floors. Big firms have their own brickfields and import steel-work, paint, cement, etc., just as we do. As their establishment is charged to works, it is natural that their rates are higher than ours. Since my transfer to Calcutta in 1905 I have seen several partners of a certain firm retire on large fortunes ; these fortunes cannot be made by doing work at low rates.

1,766. (II.) Encouragement of other agency.—I think that, under the present system, private enterprise is sufficiently encouraged as there is a great deal of work always in hand. We prefer to burn our bricks instead of handing over a certain sum by way of profit to a con-

tractor. We are always certain of good bricks and have a large stock to draw from for emergencies. I think it would be a great mistake to hand over the upkeep of public buildings to private agencies. The work would be more costly and inferior. The Official Trustee gives out all repair works to private contractors and I am quite certain that owners complain of the excessive cost of repairs. District engineers are as a rule competent, but their staff is not as good as the Public Works Department staff and would need strengthening. The construction of public buildings is always carried out by contractors as explained in my reply to question (i).

1,767. (III.) Changes in organization.—I cannot answer this question without knowing what changes will be recommended by the Committee.

1,768. (IV.) Relations with other departments and sub-branches.—Satisfactory.

1,769. (V.) Decentralization.—I think further decentralization is necessary along the following lines :—

- (1). Power of sanction of Executive Engineers should be raised.
- (2). The Superintending Engineer should decide all questions of rent.
- (3). Powers of Superintending Engineers and Executive Engineers to sanction local purchase should be increased.

1,770. (VI.) Simplification of procedure.—I think the Code is not unduly restrictive, but the Accountant-General, Bengal, acts more according to the letter than the spirit of the Code. We had less correspondence with our former Examiner.

1,771. (VII.) Education.—I think that the system of education is organised on a sufficiently broad basis and that no material improvement could be made unless one college is established for the whole of India. It provides fully-qualified engineers but does not attract the best men for the following reasons :—(1) The distinction made since 1893 between the imperial and provincial services. Engineers doing the same work should draw the same salary. (2) The restriction in the number of appointments. Law and medicine are more lucrative professions and naturally attract the best men.

1,772. (VIII.) Practical training.—Existing provision adequate.

MR. J. ZORAB called and examined.

1,773. (President.) The witness stated that he was the Superintending Engineer of the Presidency Circle and that he had had twenty-six years' service, the first fourteen years of which had been spent in the Irrigation Branch. Since 1903, on his return from furlough, he had been employed in the Buildings and Roads Branch.

1,774. All the plans and estimates for government buildings in Calcutta and the Presidency Circle were prepared departmentally. The only plans and estimates prepared by private agency of which he knew were those for hostels for which government contributed grants-in-aid, and as government assisted the colleges in their building operations the plans and estimates required the approval of the Superintending Engineer. He considered that the existing system for the preparation, departmentally, of plans and estimates for government buildings was the most suitable, and that it was inadvisable to delegate that duty to private agency.

1,775. Construction work was given out on contract and was not undertaken departmentally. It had been the practice to give out work piece-meal, e.g., to give masonry work to one contractor, wood-work to another and so on, as this had resulted in a better class of work, and he doubted whether a single contractor would be capable of undertaking an entire building. There were a

few large building contractors in Calcutta, but they had only commenced submitting tenders for Public Works Department works within the past two or three years. Large contractors had tendered for the whole work in the new police office building which was then under construction, but he had not accepted the tenders as the rates demanded had, in some cases, been higher than the ordinary rates. He considered the existing system was preferable and more economical to that of giving out a whole work to one contractor, as such a contractor would eventually sub-let it to others and act himself as a middle-man only. He did not think that large contractors did the whole work themselves, and was certain, at least, that stone-work was invariably sub-let.

1,776. The Public Works Department had its own brickfield at Akra and supplied its own bricks in order to ensure the quality, and there was generally a large reserve stock of bricks available. The danger in obtaining bricks in the open market lay in the mixing up of bricks of the qualities required with those of an inferior make, and special supervision would be required to ensure a uniform supply.

1,777. The Akra brickfield was situated in his circle, but an Executive Engineer was responsible for its management. Bricks were manufactured by a contractor who

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was paid a stipulated rate for outturn at kiln site, and was responsible for haulage and cartage to the river side, from which point another contractor took over the bricks for delivery at building sites. Hence the brickfield was in reality managed by the contractors, and the position of the Department was that of a proprietor. The machinery and plant belonged to the contractors, and government virtually only owned the land. The advantage in having such a brickfield was that the several classes of bricks could be sorted there and kept in stock for future requirements. It was true that there were numerous private-owned brickfields in and about Calcutta, but the supply of bricks from such a source would lead to delays and entail trouble in their sorting. Although he had held charge of the 1st Calcutta Division since 1905, he could not affirm whether there had been any shortage of bricks since that date.

1,778. In justification of the retention of the supply of cement in the hands of the Department he stated that if it were left to the contractors it would possibly result in the supply of cements of inferior make. Prior to the commencement of the war the witness had obtained cement by indent on the India Office, but in cases in which the supply had run short he had effected local purchases. The advantage in procuring cement through the Secretary of State was that it could thus be obtained at a cheaper rate than in the open market, but he was unable to say whether such system was prejudicial to local manufacture. He had not compared English rates with those charged for Katni cement.

1,779. The statement in his written memorandum that the present system was economical was based on the fact that the plans and estimates for hostel buildings, which had come to him for check, had shown that the rates for masonry were much higher than those of the Department for this class of work. He was unable to elucidate the point further, as he had not effected any other comparisons and was not aware how private firms calculated their rates.

1,780. The Calcutta Municipality entrusted their work to private contractors. The municipal projects were generally designed by the municipal architect, but in some cases tenders had been called for, e.g., in the case of the Calcutta New Market. He expressed himself as unable to afford any comparison between the rates of the Public Works Department and those of the Calcutta Municipality, but mentioned that he did not take into account the establishment charges in his comparison of rates for hostels and had only considered the rates tendered for by contractors, as he presumed that the tendered rates included an allowance for supervision charges.

1,781. He was doubtful whether the employment of large contracting firms in Calcutta would lead to appreciable savings in supervision charges, as the amount of subordinate supervision would remain practically constant, except that it might be possible to dispense with the service of a work *sircar*.

1,782. He advocated an increase in the powers of sanction of Executive Engineers to Rs. 5,000 and affirmed that such increase would lead to a saving in correspondence and thus give the Superintending Engineer more time for other work. Although sub-divisional officers in the Irrigation Branch were empowered to make disbursements the witness did not recommend the bestowal of such power on sub-divisional officers in Calcutta, but thought that the power might be delegated in remote localities as it would save contractors the trouble of going to headquarters to receive payment of their bills. He was not in favour of any other delegations of power to sub-divisional officers.

1,783. The Public Works Department had occasionally constructed contribution works in Calcutta, and the chapel in the Presidency College Hospital, and the hospital attached to the School of Tropical Medicine were typical instances. In the latter case, the money had been raised in Bengal, and though the hospital would be state property, government had not contributed towards its erection. The question as to the management of the hospital had not yet been settled. He could not quote any instance in which work had been done by the Public

Works Department for the Calcutta Municipal Corporation, but stated that the Department undertook the quadrennial repairs to the Senate House attached to the Calcutta University.

1,784. He had had considerable experience of passed students of the Sibpur College, and affirmed that they were very good. The practical training of upper subordinates was quite satisfactory and they were not too highly trained for the work required of them. Though it was not necessary for upper subordinates, who were generally those who had failed to secure appointments as Assistant Engineers to be trained as engineers, yet he did not consider it a drawback in view of the fact that the better trained men were more useful in the Department. The lower subordinates were, in his opinion, good enough for the work they performed, and he did not favour the suggestion that a proportion of the lower subordinate staff of the Public Works Department should be recruited from the *mistri* class, as *mistris* could not speak English, which he thought essential for the purpose of drawing up measurements, etc., and he considered that a better educated and trained man was required for the work of a lower subordinate.

1,785. He had had experience of the students who came to him for practical training from the Sibpur College and considered that the present system had worked very well. The year's practical training which they received was sufficient and fitted them for the charge of a section of a work, or of small works. He further considered that the practical training received at college was sufficient, even for those who did not join government service, and would not suggest any longer period of training.

1,786. He did not approve of the formation of an Architectural Division in Calcutta, under which proposal the Consulting Architect to Government would have a subordinate Architect in direct executive charge of the construction of buildings, and preferred the existing system. In his opinion the proposed change would result in failure, as the supervision of the construction of a building was essentially the work of an engineer and not of an architect. He expressed himself as doubtful whether the formation of an Architectural Division would lead to a better standard of buildings and drew attention to the fact that as an Architect was not familiar with Indian conditions a great deal of his time would be spent in the supervision of buildings to the detriment of his architectural work proper.

1,787. (*Sir Noel Kershaw*.) He explained, with reference to the remark in his written statement that many hostels had been built by private firms in Calcutta for which government grants-in-aid had been given and the plans and estimates checked by him, that the plans to which he had alluded had been prepared by the firms who were entrusted with the execution of the works and that he only scrutinised the tenders therefor. He had observed that the rates in such tenders were 6 or 7 per cent. higher than the Public Works Department rates but admitted that after allowing about 2½ per cent. for architect's fees for plans and 1½ per cent. for quantities, the remaining 2 per cent. would cover charges for supervision and office accommodation which were not included in the Public Works Department rates and that hence private rates, instead of being higher, were probably a little lower than those charged by the Department.

1,788. He also stated with reference to the remark in his written statement that the existing system could not be improved upon that he had not effected a comparison of government rates with private and municipal rates, but suggested that the standard of work was an important factor and that municipal work was generally inferior to that done by government.

1,789. (*J. r. Mackenzie*.) When he had been a sub-divisional officer, he held the rank of Assistant Engineer and had a drawing account, and thought that lower subordinates were allowed a drawing account in some divisions.

1,790. He had not come across any *mistris* who had received any training and considered that even if they were given such facility they would not be better than lower subordinates. If *mistris* were taught estimating,

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surveying, etc., they would practically reach the same level as lower subordinates, but he did not consider such a course practicable. On principle, therefore, he was opposed to the recruitment of lower subordinates from the artisan class, but added that for a particular class of work, such as wood-work, he preferred to employ a trained *mistri*.

1,791. The Calcutta Municipality received tenders and designs by advertising for them and the acceptance of a design did not bind them to the acceptance of the tender as well. The amount of the premium was, he thought, stated in the advertisement.

1,792. He did not know of any Indian cements other than "Katni" nor had he seen them advertised. Hence he was unaware that there were firms dealing in cement in Bombay and the Punjab.

1,793. (*Rai Bahadur Ganga Ram.*) He did not know that there was a rule in the Public Works Code which prescribed that each indent submitted to the India Office had to be accompanied by a certificate to the effect that similar articles of local manufacture were not obtainable in India.

1,794. The existence of a state-owned brick kiln brought large works within the purview of petty contractors who had no capital of their own, because they did not pay actual cash for the bricks supplied but merely had the value of the bricks deducted at the time of payment of their bills. The witness added that such adjustments did away with the necessity for borrowing money on interest, and mentioned that all the works within the past two or three years had been executed, without any capital, by the *mistri* class of contractor.

1,795. His proposal regarding the increase in the powers of Executive Engineers had reference to technical sanction.

1,796. All the upper subordinates in his circle were considered fit to hold charge of a sub-division.

1,797. *Mistris* were very good artisans, but he did not consider that they would be able to replace lower subordinates unless there were separate *mistris* for each item of work. In support of the latter view he asserted that a carpenter *mistri* would not be able to do brickwork.

1,798. The rate for concrete was Rs. 32-12-0 and for limo Rs. 49 per hundred cubic feet. In the mortar used the proportion of lime and *surkhi* was one to two, while in the finished concrete the proportions were 100 cubic feet of ballast, 25 of *surkhi* and 16½ of lime. This was the quality used in foundations.

1,799. (*Mr. Cobb.*) The existence of a government brickfield was beneficial to small contractors who had no capital. Two of the contracting firms in Calcutta had their own brickfields and the remaining firms had to buy their bricks in the open market. For the erection of the new police building in Calcutta he had engaged three contractors, one for stone-work, a second for brickwork with bricks supplied by government and the third for wood-work. If the Public Works Department had not already a brickfield of its own it would not open one for a particular work. The Calcutta Corporation had no brickfield of its own. The existence of a government brickfield was an important consideration as it ensured a reserve stock of bricks and obviated the danger of not being able to procure bricks when they were needed.

1,800. (*Mr. Green.*) The witness had been stationed in Calcutta since 1905. Five years ago there were no contractors who were capable of carrying out a whole work, and it had only been within the past three or four years that such contractors had sprung into being.

1,801. (*President.*) The difference between the price of government and private bricks was slight. For the new police office building and the hostel for the School of Tropical Medicine the price had been Rs. 15-14-0 and

Rs. 16-12-0 per thousand, respectively. Bricks were sold in the open market between Rs. 16 and Rs. 18 per thousand, and their price had gone up on account of an increase in the cost of cartage and the shortage of coal, but that did not account for the difference in the masonry rates of private contractors and the Public Works Department. In his opinion the Public Works Department paid rather higher for labour than ordinary contractors, because it demanded a better class of work.

1,802. The giving of a whole work to one contracting firm would not tend to any material reduction in the Public Works Department supervising establishment, though it might possibly obviate the necessity for the employment of a work *sircar*. A sub-divisional officer would still be required to go round and see that the work was properly done and that officer would be responsible for the accounts, and the check of measurements drawn up by the contractors. He added that the giving of government work wholesale to contractors would possibly lead to the inflation of rates. The Public Works Department and private rates were nearly on a par but the latter were a little higher.

1,803. In a case of which he knew an entire work had been given to a large firm who in turn had sub-let the stone-work to another contractor, with the result that it had not proved economical and government could have done the work at a lower rate.

1,804. If cement were procured locally the Accountant-General insisted that sanction should be obtained to its purchase. He was not aware of the procedure in regard to the purchase and supply of cement direct by contractors.

1,805. He did not recommend any increase in the powers of a sub-divisional officer, but it would be an advantage in remote localities if that officer were allowed to draw cheques up to Rs. 1,000. He himself had drawn cheques up to Rs. 500 as a sub-divisional officer.

1,806. (*Mr. Mackenzie.*) He expressed himself as not opposed to the drawing of cheques of unlimited amounts by sub-divisional officers, provided such expenditure was duly vouched for, but he did not think that government would be prepared to confer the power on officers of that class. In Bengal a sub-divisional officer's powers in the matter of drawing cheques was limited but he did not know whether the limitation was due to a codified rule.

1,807. (*Mr. Green.*) *Mistris* had proved satisfactory for the particular class of work for which they had been engaged, but their knowledge was limited to their own particular trade. He considered, however, that the substitution of *mistris* for work *sircars* would be an improvement, but added that *mistris* would demand higher wages.

1,808. (*Rai Bahadur Ganga Ram.*) The witness revised the schedule of rates annually, but without reference to market rates which, however, might profitably be taken into consideration in this connection.

1,809. As standard type plans for police stations, etc., in Bengal were all prepared by the Chief Engineer, in consultation with the department concerned, he had never been consulted. The variations in specifications in Bengal and the Punjab were possibly due to varying conditions. He did not think that a comparison of the standard plans in the different provinces would be of much use in tracing the reasons for such differences but added that it might throw some light on the matter and be of some assistance.

1,810. He did not allow any particular percentage for works establishment in preparing estimates and stated that there was no rule in Bengal laying down a fixed percentage. Ordinarily, 5 per cent. was allowed for contingencies. He had had no experience of the work of large contracting firms, either in Calcutta or elsewhere.

F. RODDIS, Esq., Assistant Inspector-General of Police, Bengal.

Written Statement.

1,811. (*General.*) In the first place, building operations in the Police Department are at present in a very unsettled state. I give a short history of these opera-

tions in order to show how this situation has arisen and also because it will be of use in reference to the replies on the particular points referred to in the resolution. Up to late years the general practice has been for the Police

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Department to put up its own buildings. In early days these consisted of mud, wood and thatch. The cost was extremely small. Materials were easily obtainable from jungle and waste land and *chaukidars* and *begar* work were freely employed. Entries in the "register of lands and buildings" kept up in the district offices still show that many police stations were erected with the help of local *zamindars* and *chaukidars*. In later years, with the reclamation of waste land and jungle and the great advance in prices and style of living, a better class of building became necessary not only to keep the men contented but also because buildings, constructed with the, so to speak, ephemeral materials mentioned above, are now-a-days costly to maintain. Type plans were introduced and improved from time to time and contractors commenced to be employed. Efforts to build without such aid were often attended with disastrous results. The agency of the Public Works Department was utilized for more important buildings at district and sub-divisional headquarters.

(2). At the present time, the type plans are for brick and mortar with corrugated iron roofs for cooksheds, etc., as the Public Works Department have advised this course in order to reduce the cost of maintenance. The standard has advanced beyond the scope of the police, and minor units such as head constables' quarters and cooksheds are now the only type plan buildings which can be constructed within the Rs. 2,500 limit fixed for buildings put up without Public Works Department agency.

(3). Efforts are now being made to replace the old *kutcha* structures and to utilize the Public Works Department as far as possible, but owing to the lack of funds progress has been very slow in this respect and, generally speaking, the police are still housed in inadequate and unhealthy buildings which are patched up from time to time by its own agency. Any new police stations which may be sanctioned are opened in temporary sheds. A complete review explaining the present position has been submitted to government. A crore and a half of rupees is necessary to provide proper accommodation, and it is hoped that in due time the provision of sufficient funds will enable the Public Works Department to take over all buildings.

(4). I have explained above how the standard of accommodation has progressed beyond the scope of police officers. It is essential also that Superintendents, inspectors, and sub-inspectors should be relieved of extraneous work of this nature in order that they may devote their time to their own legitimate duties. Any changes recommended by the Committee should not bring about the retrograde step of involving, in any way, police officers in the responsibility of building operations and they should be relieved of all work in this connection.

1,812. (I.) **Economy and suitability of methods of execution of public works.**—The methods at present in vogue for the execution of police buildings by the Public Works Department are suitable. Complaints have been made on occasions that the workmanship is faulty, but this is greatly superior to that experienced in the same style of buildings put up by the police. There is a general sentiment that Public Works Department rates are expensive, but it is extremely difficult for a layman to say whether they should be cheaper or not. Buildings erected by the police in the past were cheaper in the first instance, but do not last as long and cost more in repairs and upkeep. The Public Works Department supervision charges as far as they affect this department are not expensive. Such charges as find their way into the estimates are for temporary works establishment only which consist generally of a work *sircar*, on Rs. 30 per mensem, and

sometimes a *peon* in addition. These charges work out at 1 to 2 per cent. of the total estimates. The sentiment that the work should be done more cheaply must be due, therefore, to charges for actual materials and labour. I have tried to check this by comparing buildings constructed by (1) Police, (2) Public Works Department agency, but it is impossible in the time at my disposal to compare merits when so many factors vary, such as quality of materials, accessibility of site, increase of prices due to war, etc. I give my views in the next paragraph as to whether more economy could be obtained by the introduction of a new agency.

1,813. (II.) **Encouragement of other agency.**—Under the existing system private enterprise is sufficiently encouraged. Type plans for all units of buildings, both single and double storied, and quantity forms have been standardized and work is given out to contractors by the Public Works Department. The necessity therefore of stimulation to private firms does not arise as regards the Police Department.

(2). It is possible that in large towns, especially in Calcutta, projects could be safely handed over to contractors, with a government inspecting agency. The Bengal Police, however, are concerned but very little with large projects in large towns. I doubt very much if Calcutta firms would contract for such small items, comparatively speaking, as the construction of police stations in out-of-the-way places in a district, and police stations comprise the great majority of our projects. Small local firms with, in the majority of cases, no reputation or name to keep up must continue to be the constructing agency. Any other checking agency than the Public Works Department would have to be as critical and particular and would merely be a substitution for the present system.

(3). The situation in the police at present, however, is abnormal. As I have explained above, we require a crore and a half of rupees for some hundreds of places. District boards and many municipalities have qualified engineers, but I do not see how they could be utilized in view of this large programme of work. In the review on the subject which has been submitted to government it has been suggested that it would appear to be advisable to open two or three special Public Works Department works divisions for police buildings only, and thus complete the scheme within four or five years. If some system of this kind is not adopted it is anticipated that the Public Works Department will not be able to spend the money. Even on the arrival of the happy day in which the force will be housed in *pucca* buildings, the upkeep of which should not give much trouble as new construction will be required only for newly sanctioned posts, the management will be beyond the powers of district and municipal engineers. With the existence of the present Public Works Department staff in districts, the impression is abroad that the actual construction should be done more cheaply and in some instances more efficiently, and I do not see that the supervising agency can be minimized in any way. A new inspecting agency with but occasional supervision would not be sufficient. To sum up, contractors are employed by the Public Works Department on police projects and no stimulation of private firms is necessary in this respect. Any other agency would have to be as particular and critical as the present system and it is essential that the Police Department should be absolved altogether of work in connection with buildings.

1,814. (IV.) **Relations with other departments and sub-branches.**—The Public Works Department meets our needs.

MR. F. RODDIS called and examined.

1,815. (President.)—The witness stated that he was Assistant Inspector-General of Police, Bengal.

1,816. Up till about twenty-five years ago, the general practice had been for the Police Department to construct and maintain their own buildings. Of late years, however, contractors had been employed for this purpose. The Public Works Department had con-

structed very few buildings, comparatively speaking, and these were mostly at headquarters stations of districts. The better class of building now required had advanced beyond the scope of the Police Department and this was the main reason why the departmental system had been given up. Other reasons were that the style of building now required took a long time to construct, and that the

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accounts took time, in fact altogether too much of the time of the officer responsible for their construction had to be devoted to the work. Generally speaking, outside headquarters stations, police buildings were still maintained by the Police Department, but within the last four or five years the Public Works Department had taken over a few. There was no hard-and-fast rule under which the Public Works and Police Departments were required to construct certain buildings, it was merely a question of funds. Buildings constructed by the Police Department were more or less sheds which required no technical skill and were capable of being constructed even by villagers. As soon as funds were available it was hoped that the Public Works Department would construct all the Police Department buildings.

1,817. The construction of a better type of police building was necessitated now-a-days in order to keep up the dignity of government, also because the men were not satisfied with the old *kutchra* type of shed which, as advised by the Public Works Department, it was found very expensive to maintain. He could not say that the constable had actually demanded a better type of building, but the sub-inspector class were certainly accustomed, at present, to a better class of building than was generally given to them.

1,818. The limit fixed for the construction of buildings by the Police Department agency was Rs. 2,500. If the buildings in a police station had to be attended to by the Public Works Department, that Department would be asked to undertake the necessary repairs and also any new extensions contemplated in that station, but in places where buildings had already been constructed by the Police Department, that department would undertake the repairs and extensions.

1,819. He advocated that the Police Department should be entirely relieved of the construction as well as the maintenance of its buildings, so that officers could devote more time to their own legitimate duties.

1,820. He had had no experience in connection with the maintenance of buildings by district board engineers, but thought that it might be found practicable provided that all buildings were *pucca* and in a thoroughly satisfactory condition to hand over the repairs to district boards instead of to the Public Works Department. He did not anticipate that any objection would be raised to such an arrangement by the Police Department.

1,821. He had found it impossible to effect a comparison of the rates for buildings constructed by the Public Works and Police Departments, respectively, because of the varying factors of type, accessibility of site, etc. Generally speaking one class was *pucca* and the other *kutchra*; the quality of materials also differed.

1,822. (*Rai Bahadur Ganga Ram*.) The mortar used in the type plan buildings was, for some purposes of lime, for others it was composed of mud. In the construction of constables' quarters, for instance, lime mortar was used in the important parts of the walls, but the mortar used for other purposes was of mud.

1,823. Given sufficiently high plinths, the shed type of buildings for constables did not affect their health. The fact that constables had to live in such buildings might have a little influence on recruitment, but it was difficult to pronounce a definite opinion. The better class of building now being constructed for constables would, he thought, certainly tend to encourage recruiting, but no considerable difficulty was experienced at present in this connection, as the police force was only some two hundred short of its full strength.

1,824. *Kutchra* buildings were costly to maintain. Figures in this connection had been worked out by the Public Works Department some three or four years ago, but he could not remember exactly what they were.

1,825. With regard to repairs to police buildings being undertaken by the district boards, it was pointed out to the witness that, as these buildings were so isolated, the travelling allowance granted to the district engineer would amount to more than the cost of repairs. The witness stated, however, that it seemed to him that the important point was to see that the repairs were properly done.

1,826. The Inspector-General of Police had strongly objected to the cost of the upkeep of the shed type of buildings for constables, and was desirous that the Public Works Department should take over all police buildings, not only on account of the expense, but also on account of the trouble involved in looking after them. As a matter of fact, the Police Department could not maintain their buildings in a satisfactory condition, and had to ask the Public Works Department to take them over. This they had done in many instances.

At Calcutta, Thursday, 8th February 1917.

PRESENT :

F. G. SLY, ESQ., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

C. S. COBB, ESQ., M.V.O.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.

A. T. MACKENZIE, ESQ.

And the following Co-opted Member :—

The HON'BLE MR. H. H. GREEN, Chief Engineer and Secretary to the Government of Bengal, Buildings and Roads Branch.

D. G. HARRIS, ESQ. (*Secretary*).

The HON'BLE MR. L. BIRLEY, C.I.E., I.C.S., Secretary to the Government of Bengal, Revenue Department.

Written Statement.

1,827. My views are based on my experience as Collector in the districts of the 24 Parganas, Cuttack, Nadia and Dacca from 1908 to 1915, and my experience relates to the *mofussil* only.

1,828. The first paragraph of the Resolution of the Government of India, No. 06-E.A., dated the 24th November 1916, apparently contemplates a system under which the Public Works Department—

(a) constructs and repairs buildings and roads otherwise than through contractors;

(b) undertakes work for district boards and municipalities.

This system does not prevail in Bengal, but it is probably intended that the following questions should be considered, viz. :—

(a) whether it is practicable to give contracts for the construction and repairs of government buildings to superior contractors who will do the work without detailed supervision by subordinate officials and with only general supervision by superior officers of the Public Works Department;

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[Continued.]

(b) whether it is practicable to have the construction and repairs of government buildings carried out by district boards and municipalities.

1,829. I do not think that the first of these systems is practicable in the *mofussil* because contractors of the required standing are not ready to take up small and scattered projects, and even if under the system proposed they did take them up they would not be able to spare the services of competent engineers to supervise such work except at a prohibitive cost; still less would they be ready to take up petty repair work.

1,830. The second question, *viz.*, of a more extensive use by government of the services of the engineering staff of district boards and municipalities is one which merits investigation in Bengal. *Prima facie* it is not an economical arrangement under which the Executive Engineer and the district engineer are both required to visit an outlying sub-division and to have a subordinate officer stationed there, the government officers dealing with the sub-divisional office, *munsifi, thana* and sub-registry office, and the district board officers dealing with the dispensary buildings, inspection bungalows and roads and bridges. It is still more anomalous that the Executive Engineer should be required to visit an outlying *thana* or sub-registry office in the sub-division when the building is under construction or repairs, when the district engineer is also required to visit the same place to inspect the road leading to it.

1,831. The arguments which may be used against transferring to the district board the duty of constructing and maintaining government buildings in the *mofussil* are—

(i) that the district boards would not like to undertake the work;

(ii) that the engineering staff of the district board is not competent to carry it out;

(iii) that the government could not safely entrust its property to an authority over which it had not complete control, especially with a possibility of the chairman of the district board being a non-official.

These difficulties may not be insuperable and an endeavour might be made to meet them on the following lines:—

(1). An arrangement should be made with the district board for payment to them by government of a fixed sum annually (subject to revision at stated periods) for the charges for supervision of works of construction and repairs, and in particular in fixing the sum it is necessary to provide for the preparation of plans and estimates even in cases where no buildings are ultimately constructed; this would enable the district board to foresee their requirements and resources and to provide suitable establishment for the work to be undertaken. The system of individual payments to district boards for the services of the district engineer for each of several projects as in force in the case of works executed by district boards for estates under the Court of Wards is very troublesome and the income from this source being irregular, the district board cannot increase its permanent staff and make proper provision for the extra work, with the result that its own work and that of the Wards' estates suffer.

(2). Provision should be made for closer supervision of the work of the district engineer by the Superintending Engineer. It is possible that the proposed transfer of work from the Public Works Department to the district board would relieve the Superintending Engineer of so much office work that he would have time for more inspection, but it is probable that the number of Superintending Engineers would have to be increased.

1,832. Some experience has been obtained in Bengal of the system of entrusting district boards with the maintenance of provincial roads. Until a short time ago the Grand Trunk Road of which 150 miles lie in the districts of Howrah, Hooghly and Burdwan was repaired by the district boards concerned; it was then taken back by the Public Works Department. It is desirable that all such cases of provincial roads should be dealt with on a consideration of the circumstances which are most likely to ensure the road being kept in good order; it was in my opinion a mistake to resume the last 50 miles of the

Grand Trunk Road which used to be repaired by the Asansol Local Board under the Burdwan District Board; the members of the Asansol Local Board use the road a great deal and it was kept in excellent order.

(2). On the other hand, it is obviously desirable that the Public Works Department should retain control of the provincial roads in Cuttack district, where a large staff is necessarily maintained for irrigation work and could be economically employed on maintaining the roads.

(3). The provincial roads in the 24-Parganas district were in my opinion satisfactorily maintained by the district board engineer.

1,833. Since writing the above, I have examined the correspondence of 1896, when a committee was appointed to consider the results of the scheme in force from 1892 to 1896, under which provincial works were entrusted to district boards. The condemnation of the system by the committee follows as a surprise after the reports which were submitted to government by Commissioners and Superintending Engineers; these reports were summarized in the Secretariat in the following sentence:—

"The opinions are almost unanimously to the effect that the system, as a whole, has been successful, but that there are defects in the manner in which it has been worked, which should be remedied."

The correspondence shows that the defects in the system may be briefly classified as—

(a) unbusiness-like arrangements between government and district boards for remuneration for services, and

(b) the indefinite character of the control exercised by the Superintending Engineer over the district engineer.

The first class of defects appear to me to be remediable, the crux appears to lie in the second class, and the difficulties would be largely increased if district boards had non-official chairmen.

1,834. On the whole, as a result of reading the correspondence of 1896, my conclusion is that the system was then abandoned prematurely, but that to introduce it again with a prospect of non-official chairmen of district boards and a consequent aggravation of the position of the district engineer as a servant with two masters, and in view of the very large building programmes of the Police, Education and Registration Departments and of the schemes for building new district and sub-divisional headquarters and quarters for circle officers, would be the assumption of an unjustifiable risk, and that a period during which "bricks and mortar" constitute one of the most pressing needs for improving the administration of the province is not the right time for scrapping the Department of Public Works. A further consideration is the fact that the organization of district boards is subject at present to a considerable strain on account of the increase of their spending powers due to the grant of the public works cess: it is desirable that the full establishment of the circle system should ultimately be followed by a considerable decentralization of the work of district boards, and when this has taken place and the building programmes have been completed the circumstances will be more favourable for entrusting government public works to district boards.

1,835. Of the particular points into which the Committee will inquire I have further remarks to offer on two only, *viz.*:—

(i) whether the methods at present adopted for the execution of civil works are economical and suitable for the purpose for which they were devised; and

(ii) whether the Public Works Department meets the needs of other departments of the Administration.

These two subjects can be discussed together.

1,836. I have often heard the opinion expressed that the work of the Public Works Department is expensive compared with work done by private enterprise. I am not convinced that the work is ultimately expensive. It is generally held to be good work, and the cost of repairs to cheap buildings is so high that a comparison of the initial cost of two buildings without a comparison of the cost of upkeep is fallacious. The existence in the Dacca district of cheap buildings for schools, dispensaries and police-stations constructed by private or departmental agency without adequate supervision occasioned

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very heavy charges for repairs and renewals, and a more serious consequence than these heavy charges is the extent to which the time of all officers concerned is taken up with questions of repairs and renewals.

1,837. Partial explanations of the high rates for work done for the Public Works Department may be found in delay in payment of bills for work done and in the frequent practice of getting work done in a hurry at the end of the financial year. Delay in payment of bills is often said to be due to demands for illegal gratification by subordinate officials and to want of business-like habits in the offices of Executive Engineers. I am not in a position to say whether these accusations are well founded.

1,838. The practice of getting work done in a hurry at the end of the year is one for which the Public Works Department is not responsible. I believe it to be attributable to the following causes:—

(a). Where the total amount of money available for provincial expenditure is variable from year to year it is inevitable that the variations should be dealt with by regulating the amount spent on public buildings, this being the expenditure which can be postponed or accelerated with less dislocation of work than other expenditure; in these circumstances no department knows in advance what money will be available for expenditure on its building schemes in future years, nor can it frame a building programme with any hope of carrying it out.

(b). In many parts of Bengal a small building project like the construction of a police-station or a sub-registry office cannot be carried out satisfactorily within a period of 12 months; such a project in Eastern Bengal normally contains 3 stages, *viz.*, the acquisition of the land, the raising of the site, and the construction of the building. Even if the execution of the work is sanctioned early in the financial year, it will very likely be impossible to begin construction earlier than February with the result that the building will be constructed in a hurry. There is a tendency to withhold orders for initiating execution of a project until it has been decided that the funds for completing it are immediately available; an improvement would be effected if, on the approval of a project as a whole, land acquisition was undertaken in one year (though funds were not available for the whole work), and the raising of the site in the second year and the construction of the building in the third year.

1,839. Though the quality of work done by the Public Works Department is generally held to be good, it is frequently asserted that there is great delay in getting plans and estimates and that the amount of the detailed estimate often largely exceeds that of the preliminary estimate. The occurrence of this delay and of these divergences between preliminary and detailed estimates are facts, but they are in my opinion chiefly due to two causes for which the Public Works Department is not responsible; the first cause is that the requiring officer often asks for plans and estimates before he has considered to the best of his ability what his requirements are; the second is that after the Executive Engineer has prepared a plan to the satisfaction of the requiring officer, the latter has frequently been transferred before the project can be undertaken, and his successor has other ideas and wants to have the plan revised. My experience has been that when requirements are definitely stated and when the requiring officer takes reasonable pains to explain them and to get advice, schemes can be matured without undue delay; but expeditious results cannot be expected from the Public Works Department or from private agencies if requirements are not properly considered before advice is asked for.

1,840. I can assert on personal knowledge, and without fear of exaggeration, that of the time of the officers of the Public Works Department in the Dacca district which was taken up by the preparation of plans and estimates while I was at Dacca from October 1912 to May 1915, at least three-fourths was taken up in connection with schemes which had no result during that period nor during the subsequent 18 months up to date; this statement would be no exaggeration even if the work done on the Dacca University scheme was excluded. I may add that as far as I know the whole of this work was done in accordance with the orders of authorities who were competent to call for it, and that a very considerable proportion of it has been abandoned or is likely to be abandoned and has not been merely postponed for financial reasons. I do not suggest that there were not good grounds for calling for the plans and estimates, but the point to which I invite attention is that this kind of work has to be paid for in some form or another, and that the effect of its existence is to raise the establishment charges on work which is actually executed.

The HON'BLE MR. L. BIRLEY called and examined.

1,841. (*President.*) The witness stated that he had held the post of Collector in Bengal for six years.

1,842. With regard to the amount of government control exercised over district boards he remarked that a district board had practically full control over its own budget, but that as the Collector was almost always the chairman of the district board and the budget was sent through him to the Commissioner, it was open to the control of both those officers. The Commissioner seldom made alterations in a district board's budget.

1,843. The accounts of district boards were audited by government agency, and he thought that government had absolute power under the Local Self-Government Act to enforce specific instructions of the Audit Department in the same way that government had powers under the Municipal Act. Without a reference to the Local Self-Government Act, however, he could not state definitely whether government reserved the right to supersede an inefficient district board by the appointment of a government officer for its management, because he had never known of such a case or that it was even contemplated.

1,844. District board works were inspected by the Superintending Engineer, who in this capacity was designated the "Inspector of Works," and the Executive Engineer had no concern with the district board. The Superintending Engineer, as Inspector of Works, had no executive power in regard to district board works, and was only required to inspect works and to offer such advice and criticism as he thought fit. A defect in the existing system was that it led to duplication of staff

in districts, owing to the existence of a government Public Works Department staff and a district board engineering staff, both of which performed similar duties in the same area, but though he considered the employment of a single agency as the ideal to be aimed at, and that it was anomalous to have two, as at present, he did not think that existing conditions rendered such a course practicable.

1,845. The transfer of government works would place at the disposal of district boards larger funds, but he could not affirm whether the boards would welcome such a transfer, as it might so happen that the services of the district engineer might be required for government work at a time when the district board also needed him for its own work. In view of the fact that the Collector was the chairman of the district board, and that in his dual capacity he would be responsible for the execution of both classes of work, he did not think that this contingency was very likely to cause trouble at the present time if government work were immediately transferred to the boards. But if the non-official chairmen of district boards became numerous, he thought that there would be great likelihood of friction arising from the fact that the Collector would require the services of the district engineer in the interests of government when the non-official chairman required them in the interests of the district board. Even if government made over the maintenance of all government buildings and roads to district boards and made them solely responsible for their upkeep and thus placed the engineer under one controlling authority, *viz.*, the district board,

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he considered that the Collector would be the officer most interested in getting such work as repairs to government buildings done, whereas the district board would not be interested in the condition of government buildings to the same extent as that officer and other officers of government were. *He did not mean to imply that government buildings could not be properly maintained by a district board after their transfer to such authority, but that the work was not likely to be done to the satisfaction of government officers, more especially if a non-official gentleman happened to be the chairman of the board, whereas such would not be the case, if repairs were attended to by a government officer.

1,846. He understood that an additional number of non-official chairmen of district boards was contemplated in Bengal, and added that though there had been none until recently there were now either one or two such chairmen. It was not feasible for government to exercise control over district boards in the matter of the maintenance of government buildings by delegation to the Superintending Engineer as Inspector of Works of plenary powers in the matter, as a district board under a non-official chairman would not like to receive absolute orders from the Superintending Engineer, even though the government provided the funds for the maintenance of these buildings. A transfer to district boards of government works on such conditions would not be welcomed as it would not be a substantial advance towards local self-government, nor would the boards consider it as such whether they were made responsible to the Inspector of Works for the repair of government buildings, or not.

1,847. In his opinion there was no great danger in transferring the repair of provincial roads to district boards which, at present, undertook the repair of local roads, and government might allot funds to district boards for the purpose of such maintenance work. But in effecting such a transfer it would be necessary to consider carefully which roads could safely be entrusted to the care of district boards as while one board might be quite capable of maintaining roads made over to it to the proper standard of efficiency another might not, and in some cases it would be preferable to retain the roads in the hands of the Public Works Department which in certain areas by reason of its location and other reasons could perform the work more satisfactorily. Of 150 miles of the Grand Trunk Road in Bengal which he had alluded to in his written statement, he considered that the last 50 miles of that road might with advantage be made over to the Asansol Local Board for maintenance particularly as it had previously done the work satisfactorily. On the other hand, the remaining portion which was nearer to Calcutta had not been kept up to the required standard of efficiency by the district boards concerned, and hence he thought that it would be better to keep this portion in the charge of the Public Works Department. He did not approve of the duplication of staff in districts and desired the employment of a single agency, if a practicable method could be evolved. The case of the Grand Trunk Road was one of the practical difficulties with which the proposal was surrounded, but was not one of the fundamental difficulties, which latter in his opinion were insurmountable at the present time.

1,848. He had had no practical experience of the scheme which was given a trial in the nineties under which certain government works were transferred to district boards for management as that scheme had been abandoned in the year 1896 and he was not then in the service. The passages in his written evidence which related to this scheme were, as stated therein, based on recorded papers from which he had gathered that the scheme had hardly been given a fair trial and on the evidence of those papers he thought that at that time the scheme might well have been given a further trial, with certain modifications. This view, he added, had been entertained by a large number of people who were consulted at the time. He would not, however, advocate the revival of the scheme in selected districts partly because of the fact that the appointment of non-official chairmen of district boards was contem-

plated and partly because district boards had recently had their resources augmented by the transfer to them of the public works cess and had not yet adjusted their organization to cope with the larger expenditure that was possible with the increased funds. The present time, for this reason, was not a favourable one for them to take over any additional work. Besides, there were some large building schemes pending in various parts of the province which were quite beyond the abilities of district boards owing to their magnitude. The public works cess was equivalent to the road cess which constituted the principal source of income of district boards prior to the handing over to them of the public works cess and as the public works cess had been made over to the boards within the past three years, their income had approximately been doubled and as a consequence they had now considerably more work to perform than formerly. He mentioned that government had not decided definitely to make over the public works cess outright to district boards to utilize as they desired and that the greater part of it was actually spent on public works. When the cess was under government control it was treated as a receipt of government, and it was now credited to local funds. There had been discussion on the question of limiting the objects on which the money arising from the cess should be spent, but no final decision had been reached. As a matter of fact the cess was at present generally reserved by district boards for expenditure on public works.

1,849. As the former chairman of a district board he thought that such boards carried out their own public works to a fairly good standard of efficiency, but that a great deal depended upon the personality of the district engineer. He knew of one district board at least which had an able engineer. The present system for the execution of district board works was fairly satisfactory and he could not suggest how improvements might be effected.

1,850. The relations of the Public Works Department with other departments were generally satisfactory. He had had experience of the erection and maintenance of its own buildings by the Police Department, but thought that that system had not proved satisfactory. Its drawbacks were that such buildings were generally not of a permanent nature, and that a great deal of the time of the police which might otherwise have been spent more advantageously on their more legitimate duties was under that system utilized on petty questions concerning estimates for the repair of buildings and the provision of funds therefor. He had not considered the question of economy in relation to police buildings but mentioned that it was analogous to the erection of buildings for schools and dispensaries of which he had had experience, and that in his opinion such works were not economical, because they were of a temporary nature and thus cost a great deal to repair. The demand of the Police Department for a higher standard of buildings was reasonable because the temporary structures at present erected in many places were not fit to live in, not because they were inferior to those inhabited by private people, but because they needed more frequent repairs than they got. He did not think that the police resorted to any coercion in procuring the services of village watchmen for the erection and maintenance of their own buildings.

1,851. He did not favour the handing over of buildings to departments for maintenance in order to relieve the Public Works Department of a great deal of work which was not of a technical nature, e.g., the transfer to a Collector for maintenance of all the buildings in his district, because he thought such work would occupy a great deal of the time of civil departments which might be better employed otherwise, and it was likely to lead to neglect in many instances. In his opinion it was advisable to have the special staff of the Public Works Department to attend even to the ordinary annual repairs of buildings in the whole district, e.g., white-washing, tile-turning, repairs of broken glass, etc.

1,852. He affirmed that the Public Works Department was called upon to prepare a great many plans and

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[Continued.]

estimates which never came to fruition, and that it ought not to be requisitioned by other departments until they had thought out their own requirements more thoroughly. But he thought that under any system which was devised for the construction of buildings there must necessarily be cases where estimates could not be carried into execution. One of the reasons why the Public Works Department was given needless work was that its services were often requisitioned by local officers of departments before they had given sufficient forethought to their requirements.

1,853. He amplified the statement in paragraph 1,840 of his written evidence where he had stated that at least three-quarters of the time of the Public Works Department, when he was in Dacca from October 1912 to May 1915, was taken up in connection with infructuous schemes, with the remark that the assertion would be no exaggeration even if the Dacca University scheme were excluded. His observation applied to schemes in general the majority of which were initiated at the instance of government.

1,854. In regard to the contention of the Public Works Department that plans and estimates had to be revised frequently owing to modifications in the views of the requisitioning departments and to the suggestion that the requisitioning department, after it had signed the preliminary plan and estimate, ought to have no further concern with it, i.e., that the requisitioning officer ought to decide once and for all on the rough ground plan as to what was required and how it was to be provided and that once having affixed his signature to that estimate he ought to leave all the details solely to the Public Works Department for settlement, he remarked that objections were not as a rule raised at the time of the preparation of the detailed estimates but at the preliminary stage. He added that it often happened that the departments altered their views at the final stage on occasions where there had been changes in the *personnel* of the departments owing to disagreement between the views of the relieved officer and those of his successor, thus necessitating a complete revision of the estimate. But he doubted whether the introduction of a hard and fast rule in this connection would be feasible. He agreed, however, that it ought to be made very difficult for an administrative officer to insist on additions to a plan once it had been approved by him except in cases where undue consideration had been given to the administrative requirements, and a refusal to alter a scheme would lead to the erection of a building which was really not what the administrative department needed. His experience had been that the local officer of an administrative department was more responsible for the trouble caused by unnecessary alterations than the head of the department himself, firstly, by an insufficient consideration of the requirements, and secondly by changes proposed by his successor. He did not recollect any case in which a Commissioner had intervened unnecessarily, but there were many cases where he had done so when the executive officer had dealt with the details in a perfunctory manner. His conclusion therefore was that it should not be made impossible for an administrative officer to criticise a plan at the detailed stage, though he ought generally to be able to effect whatever scrutiny was required of him at the initial stage seeing that he was principally concerned in examining carefully the accommodation proposed with a view to secure that it should be sufficient but not unduly lavish. Provided a civil officer obtained the space required he saw no reason why the detailed estimates should not be disposed of by the Public Works Department.

1,855. (*Mr. Cobb*.) There was no reason which precluded a particular local civil officer from settling, before the preliminary stage of a plan was reached, with the head of his own department what was really required of the Public Works Department. For instance, if a school was to be built, there was no reason why the headmaster could not indicate exactly what he required to the Education Department, before application was made to the Public Works Department. But a really more effective way of meeting the difficulty was for the local

civil officer to discuss matters personally with the Executive Engineer or sub-divisional officer on the spot, in order that he might receive suggestions for the improvement of his views. The case might then be submitted direct to the head of the administrative department as soon as the preliminary plans had been drawn up, instead of through the Superintending Engineer. In this way the combined knowledge of three people would be available, viz., that of the local civil officer, that of the Executive Engineer or sub-divisional officer of the Public Works Department, and, lastly, that of the head of the administrative department concerned, and generally no further alterations should be permitted after all these were agreed. Possibly such a procedure might overcome the present difficulties, but the essential point was that the local civil officer ought to consult the Public Works Department authority at an early stage, at the site of the proposed work. There was one objection, however, to the final acceptance of such estimates, viz., that local civil officials sometimes asked for greater accommodation than was justified, and he was aware of a case of this nature in the Revenue Department where the Commissioner had agreed that the space asked for was excessive.

1,856. Though members of district boards were personally interested in roads, they were not likely to evince any great interest in the construction and upkeep of the buildings of government departments. For this reason he did not anticipate that roads would be allowed to fall into a state of disrepair in the event of their transfer to district boards. He expressed himself as having some sympathy with a district board which argued that local self-government and compulsion in the erection of a police station were not synonymous. The reason why local boards were more interested in the construction and repair of schools was that they were under their administration. Matters relating to the police were, however, not under the control of district boards and it was therefore natural that they should not be interested in the construction and maintenance of the buildings for the police force.

1,857. (*Rai Bahadur Ganga Ram*.) He was not quite certain whether there were one or two non-official chairmen of district boards in Bengal, and mentioned that he had only heard within the last few weeks of the appointment of one of them. He did not know whether those non-official chairmen belonged to the class of pleaders or *zemindars*, and added that they had not been in office long enough for cases to arise in Bengal involving the replacement of a non-official chairman by an official.

1,858. He could not say definitely whether the portion of the Grand Trunk Road he had referred to as having been withdrawn from the district boards for maintenance by the Public Works Department was handed over owing to the boards' inability to keep it in an efficient state of repair, as that section of the road did not lie in the district in which he had served at the time and he was not aware of the particulars.

1,859. He expressed himself as not being competent to express an opinion as to whether Public Works Department rates were higher than private rates.

1,860. For the furtherance of local self-government he recommended that the appointment of district engineers, on whose personality the efficiency of district board works generally depended, should continue to rest with the district boards. These boards would take such great exception to the deprivation of their power of appointment and dismissal of district engineers that he thought such a course quite impracticable, though in the interests of efficiency it might be more desirable if government appointed district engineers.

1,861. Tenders were invited for a district board work and were opened by the district engineer who forwarded them to the board after recording his recommendations. The board with this information before them then selected a contractor for the execution of the work. It was the practice for the chairman of the board to pay visits to works under construction in order to watch their progress, but the members of district boards seldom visited works outside headquarters, as in Bengal such members were mostly pleaders and *muktears*

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[Continued.]

who by reason of their calling resided at headquarters stations.

1,862. The accommodation in schools was generally regulated by the number of pupils that could be accommodated in each room. Most of such primary school buildings as were in the charge of the district boards were *katcha* buildings erected on a type plan, but he was not sure whether such plan had been drawn up by the Public Works Department. He did not think buildings constructed in Bengal for the Police and Revenue Departments were extravagant either in type or structure.

1,863. (*Mr. Mackenzie.*) As it was usual, when detailed estimates were submitted for technical sanction, for the cost to be in excess of the amount which had been administratively sanctioned, it was not possible to limit the administrative department to the preliminary plan and estimate only and to leave the details to the Public Works Department. He added that the department which provided the funds ought to have a further voice if the detailed estimate exceeded the preliminary estimate by more than a certain percentage.

1,864. If primary education was to become universal, unless the buildings erected for primary schools were *katcha* ones the cost would be prohibitive. An enormous number of primary schools were private-owned buildings, and the district boards had no connection with them. There were a limited number of such schools, however, which were constructed by means of grants-in-aid received through district boards and in these cases the boards attended to their repair, but they formed a very small proportion of the total number of such schools. In his district, the district board did not utilize any portion of the public works cess on education.

1,865. In explanation of his view that it was impossible for district boards to take over the construction and maintenance of all government buildings as well as roads, he stated that in some districts, especially in the small ones, where there was no Executive Engineer stationed at the headquarters station and there was only a district engineer and a small number of buildings, he thought it might be found convenient for the district engineer to repair a government building, provided the Collector continued to be chairman of the district board; but if there was uncertainty as to the Collector's tenure of office as chairman, he did not think such a course would be desirable. Besides, there would never be a sufficient number of large works in most districts to justify the employment by district boards of a sufficiently good engineering staff of their own to supervise the construction of such works; hence he was of the opinion that it was not practicable to hand over large government works to these boards.

1,866. (*Sir Noel Kershaw.*) He did not think that the preliminary estimate should be prepared before the site of a building was selected. He mentioned that he had had to deal with two schemes for new sub-divisional office buildings for which plans were prepared after the location of the sites was known.

1,867. If the chairman of a district board was a non-official, the Collector would not have a seat on the board.

1,868. He thought the Public Works Department had been represented on the committee appointed in 1896 which he had referred to in his written evidence (*Mr. Green* here explained that the Chief Engineer of the Public Works Department had had a seat on the committee together with three Bengal civilians. The three civilians were chairmen of district boards at the time the system was given a trial and were cognisant of the working of the boards and the scheme had been in operation for only four years).

1,869. He did not think it would meet the difficulties he anticipated if government roads and buildings were handed over to district councils on the condition that the Collector was appointed to the district board as an *ex officio* member and chairman of a committee concerned with government works in addition to the non-official chairman, because he thought that there must be one chairman only who must have executive authority to decide in what order works should be taken up and issue

such orders as he deemed expedient to the district engineer. Besides it was undesirable that there should be two people on the district board, both of whom might give orders to the district engineer, and it would not be practicable to make the Collector the chairman of the district board for only government work. He did not think that the members of district boards themselves generally wanted to have non-official chairman at present. The demand came chiefly from politicians. He believed that the active members of district boards were quite satisfied with an official chairman. He realized that the probability of the eventual appointment of non-official chairmen of district boards had to be recognized and that once such chairmen were appointed they would for all practical purposes be permanent.

1,870. On reconsideration he withdrew his contention that the fact that district boards were now overburdened with work consequent on the transfer to them of the public works cess made the occasion peculiarly unfavourable for giving them further additional work and admitted that, as an adjustment of establishment to deal with the expenditure of the public works cess was imminent, it would be as well to make the adjustment at one time to provide for increased work under both heads, if it was decided that district boards should take over government work. He explained that his contention had been based on the difficulties that would be experienced in connection with the recruitment of additional district board engineering staff. Both his remaining arguments, *i.e.*, that against entrusting government works to district boards likely to have non-official chairmen, and that based on the absence of interest on the part of district boards in government works were, he considered, strong enough to outweigh the advantage of having a single staff in the districts by transferring government buildings and roads to district boards, and he added that as no man could serve two masters so it was inconceivable that district boards would treat government work in the same way as their own. District boards, in his opinion, would not regard it as a step in the direction of obtaining control over the police if they were given police buildings to construct and maintain, or as a step towards local self-government, if they were allowed to build secondary schools in their districts.

1,871. (*Rai Bahadur Ganga Ram.*) The Executive Engineer was not an *ex-officio* member of the district board in his district.

1,872. Tenders were discussed by the members of district boards at a meeting and their acceptance went by the majority of votes. There had sometimes been signs in the selection of contractors that canvassing of members had taken place.

1,873. (*Mr. Green.*) When informed, with reference to the contention in his written evidence that that portion of the Grand Trunk Road which was taken over by the Public Works Department need not have been transferred as it had been well maintained by the Asansol Local Board, that the transfer took place only in November 1915, he remarked that the portion of the road to which he had referred was in an exceedingly good condition in December 1915, only a month after it was taken over.

1,874. He did not think the district board establishments, as at present constituted, were competent to carry out important government works in the *mofussil*, but if these boards had the assurance that government work would be made over to them and received regular (not intermittent) and adequate remuneration they would improve their establishments.

1,875. When the experiment was last tried the boards were not aware of the extent of the operations they would be called upon to handle, and attempted to carry out the work without any addition to their own staff. The present time was not suitable for the transfer of government work to district boards, owing to the many large building programmes in contemplation.

1,876. When large projects were under consideration they were submitted to the Commissioner by the Collector, hence the former was cognisant of the details from their inception.

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MR. B. HEATON.

[Continued.]

B. HEATON, Esq., Principal, Civil Engineering College, Sibpur.

Written Statement.

1,877. *Recruiting by guaranteed posts.*—Present system of recruiting by guaranteed posts to colleges.

As regards the officer grades I am of opinion that this system may well be changed.

The number of posts guaranteed to the engineering colleges are as follows:—

Thomason College, Roorkee	6
Sibpur College	1
Madras College	1
Poona College	1

In addition 1 *ex-student* from each of the colleges is promoted in alternate years from the subordinate grades.

As far as direct appointments are concerned the Thomason College has twice as many as all the other three colleges combined.

The course of training offered at the Thomason College is in no way superior to that offered at Sibpur. The initial educational qualification of the students is much the same, except that the Thomason College insist upon candidates passing a simple entrance examination in addition to possessing certain other qualifications.

The Thomason College course lasts three years, that at Sibpur is four years and each college course is followed by a one-year period of practical training before the full college certificate is granted. The possession of these extra guaranteed posts certainly makes the Thomason College course more attractive to the guardians of students, and as the college charges higher rates for training they probably recruit students from a richer stratum of society.

The majority of *ex-students* of the engineer class of the Thomason College are able to obtain employment as officers, while at Sibpur and I believe at Madras and Poona also the majority of the students have to seek employment in subordinate positions.

This is a state of affairs for which these colleges are in no way responsible and is one which has been forced upon them. Its existence and continuation is not justified.

1,878. *Comparative efficiency of Indian engineering colleges.*—In comparing the comparative efficiency of other engineering colleges with Roorkee we must, to do them justice, not forget what a very great undue advantage Roorkee has had by being *bolstered up* with so large a number of guaranteed posts, while as regards Sibpur another factor that has acted disadvantageously to us is our history.

Roorkee was founded in about 1856 and has had an uninterrupted career at Roorkee of over 60 years besides getting an undue share of government favour.

The first Bengal engineering college was founded in Calcutta in 1858 and was administered by the Public Works Department; after 4 or 5 years' experience it was handed over to the Education Department and amalgamated with the Presidency College, where it lost touch with practical engineering. In 1880 only was the Sibpur College started, advantage being taken of the empty Bishop's College buildings alongside of the large workshops that the Public Works Department were then constructing to remove the college here into close touch with the Public Works Department.

Sibpur as Sibpur has had an existence of only 36 years compared with the 60 of Roorkee and was never a large centre of training for Anglo-Indians. It would be strange indeed if, with these advantages, Roorkee could not maintain the reputation she got in the early days when Sibpur was non-existent and higher engineering education entrusted to an Arts college.

1,879. *Proposed change regarding guaranteed posts.*—I would like to see the present system of guaranteed posts done away with as regards definite colleges and would prefer that it be substituted by a declaration:

Firstly, that when in any province an Indian is to be appointed to the superior service, a native of the province shall get the preference.

Secondly, that in making a selection of an Indian for the superior service no special preference shall be shown to the college at which he has been trained.

The education offered at the Indian engineering colleges is as good as that at an English college and they should *now* be able to stand on their own legs, and be free to develop apart from such guaranteees. As we are, however, turning out too many B. Es. at the four colleges, I am in favour of concentrating the higher training at an imperial college.

1,880. *Co-ordination of Indian colleges.*—What is needed in India is some co-ordination between the four existing engineering colleges—some saving of money and effort. I believe that if the resources in money, staff and equipment of the four colleges be pooled, they will be practically quite sufficient to provide a solution for higher engineering training in all its special branches:—

Civil (Railways, Irrigation, Sanitation, Architecture).
Mechanical and Electrical.
Mining.

1,881. *Central technical University or Federation.*—As to how this should be carried out there may be some difference of opinion. Whether one central technical University should be formed, controlling its own courses and giving its own degrees, or whether we should retain the present engineering colleges in a sort of Federation and co-ordinate their studies.

In this latter case the colleges would recruit their students from the same areas as at present. They would train them up to a common standard of fundamental essentials of, say, a two-year course after which the students would be free to go for further training in any one branch, each college specializing in one branch and teaching it to a high university standard. With such a scheme expansion would be easy. If Burma needs an engineering college she need only make arrangements for the first two years, and the leading Indian states could easily join in.

We might have colleges teaching the first two years at Roorkee, Poona, Madras, Sibpur, Rangoon, Bangalore, Peshawar, feeding higher civil engineering classes at Roorkee; mining at Sibpur or elsewhere in Bengal; mechanical and electrical engineering at Poona. It might be necessary to have a second civil engineering college at Madras. Roorkee should specialize on irrigation and municipal and sanitary engineering. Madras on, say, railways, roads, buildings and architecture.

1,882. *Future of upper subordinate classes.*—Each province would retain its own present upper subordinate classes which would retain their present function of training men of the supervisor class for civil engineering, mechanical and electrical and mining. These are badly needed in India. That is, the provincial colleges would have a closer connection with industries.

1,883. *Over-production of B. Es.*—As regards Sibpur, there has undoubtedly been an over-production of Bachelors of Engineering. The average number produced yearly is 11.5. Only 1 of these receives a guaranteed post, or if we allow for those promoted from the subordinate grades 1.5; the remaining have to look for other employment* and they are all anxious to join the upper subordinate grades. Those that fail to do so join firms of contractors or district boards, and many, I believe, only get occasional work.

1,884. *The training of overseers and sub-overseers.*—As regards the arrangements in the province for training overseers and sub-overseers, please refer to a report† written by me in 1915 entitled: "A note on the condition of sub-overseer and overseer training classes in Bengal in 1915." This is fairly complete and shows how the over-production of B. Es. affects the future prospects of students of the other classes.

1,885. *The class of students recruited at Sibpur.*—With reference to the class of students that are

* See Table I *infra*.

† Not printed.

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[Continued.]

attracted to the engineering classes I may mention that two prominent Bengali gentlemen have recently informed me that they wish to send their sons to the college, but have stated that they do not care for them to join the Bengali boarding establishments.

The conditions under which the Bengali engineer students reside at Sibpur are certainly such as make the more well-to-do parents hesitate about sending their sons here and tend to force them to send them home.

There are these points of view :—

(i). In the barracks students live eight in a room, there are no rooms that can be allotted to less than eight students.

(ii). In the mess the engineer students mix with all the other students of the college and it is run for the benefit of the very poorest.

(iii). There is only one mess with little variety of food. Students from well-to-do families cannot have separate messing arrangements and there are difficulties in the way of those, who have adopted European habits of living, from living as Europeans or joining the Anglo-Indian students' mess.

(iv). The very smallness of the cost of living at Sibpur means that practically every Bengali student can join, and as the numbers admitted are very small—about 20 Hindus yearly (my Hindu students' barrack holds only 80 students for a four-year course), I am practically bound to fill up with the cleverest boys that I can get.

This means that unless the sons of the well-to-do are amongst the clever ones (which is by no means always the case) they have small chance of selection for admission as regular students.

It is so important that we should do what we can to attract the sons of the well-to-do. They are likely to be better officers, and being accustomed to the control of men and money may be more efficient and reliable when placed in positions of responsibility.

I may mention that I have had complaints from my Bengali engineer students that, when placed for practical training in company with Roorkee Bengali students under an Executive Engineer, the latter have been accorded more social recognition, doubtless because they have been regarded by the engineer as being of different social standing. How far this may be due to the greater cost of education at Roorkee or to the arrangements there that the engineer students shall live in a suitable style I am unable to say. Their arrangements may be justified by the fact that, owing to the greater number of guaranteed Assistant Engineer posts Roorkee has, practically all their students get positions of better standing than the Sibpur graduates and that Sibpur lads may be more suitable for upper subordinates who have not so definite a social position to maintain, but this is a hard thing to say. It is due to their want of experience of better society and to their want of knowledge of English as regards expressing themselves in reports.

We do need to made our engineer students live in a better style. We must do what we can to attract the sons of the richer men who are engaged in industrial pursuits, of capitalists who wish to invest their money in industry. It is not right that the conditions at Sibpur are such that it is practically only the poorer men who care to send their sons there (perhaps attracted by scholarships), that is, our lads are mainly those who will be employes not masters.

When last revising the rules of the Engineer Department seven or eight years ago I had in mind the advisability of attracting the sons of men engaged as contractors who might otherwise have to go to England for training, and out of 40 admissions government empowered me to admit eight such as special students. Up to date practically no advantage has been taken of this : in 1909 two applicants—one scholarship holder was admitted from the Hyderabad State, the lad only completed the B. E. course, but he failed to qualify ; in 1912 one applicant, a Madrassi, was admitted who also failed to pass the I. E. There is a tendency to regard these vacancies as a means for securing the admission to the college of lads who are more properly regular students and who would fail to secure admission as such.

The cost of education at Sibpur, excluding residence, etc. The fees for tuition only are—

Engineer Department—

First 2 years Rs. 120 per session } for regular students.
Second 2 years Rs. 180 per session }
Special students pay Rs. 60 more per session.

The tuition fees for the whole four-year course will amount to Rs. 600 only for each regular student—£10 yearly.

A large number of scholarships are provided from the public funds, government and district boards.

The following analysis for 1915-16 will be interesting :—

In the Intermediate Course	27 out of 50	} students had
In the Graduate Course	20 " 24	
In the Engineer Department..	" ..	
	47	74=63 per cent.

	Tuition fees paid.	Scholarships.	Fees exceed scholarship.
	Rs.	Rs.	Rs.
Intermediate Course	8,200	6,791	1,409
Graduate Course	5,905	4,276	1,629
	14,105	11,067	3,038

The average paid during the year for tuition by each student amounted to—

	Rs.
Intermediate Course	23
Graduate Course	68

Beyond this the student has to buy his books and instruments and pay his university examination fees. For board and lodging he pays the bare cost.

The *Apprentice Department*.—It is difficult to give corresponding figures for the civil engineering, mechanical and electrical and mining classes separately. Most of the assistance is given in the form of freshships and reduced feeships ; there are altogether 70 students on reduced fees, 5 Europeans free, 25 on reduced fees and 40 Indians on reduced fees.

From the 1915-16 report I find that—

In the Sub-Overseer	} were receiving
classes 37 out of 58	
Civil Overseer 22 " 37	
Mining and Mechanical	} assistance as
and Electrical 34 " 69	
	93 " 164 = 57 per cent.

The tuition fees collected amounted to Rs. 3,213 only and the assistance given to students was Rs. 14,065, that is to say, the assistance exceeded the fee by Rs. 10,852 ; or we may say that each student gets free tuition and is given about Rs. 68 yearly towards the cost of his living at the college, Rs. 7 monthly if we calculate the session at 9 months ; here again the student has to meet his bill for books and his examination fees.

After a student has completed his college course and has passed his final examination he has to complete a year of practical training in the civil engineering and mechanical and electrical engineering classes, but not in mining. During this period he receives scholarships as follows :—

In Engineering Department Rs. 50 monthly for Indians, Rs. 100 monthly for Europeans ;

In Apprentice Department during practical training at the college there are 10 scholarships of Rs. 10 and 10 at Rs. 6 monthly to pay towards the cost of their board. These practical training scholarships are not included in the above figures.

The expenditure on such scholarships in the Engineering Department amounted to Rs. 6,480, which is larger than the excess of fees over scholarships during the college course.

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1,886. Qualification of students admitted to the Engineer Department.—

New University courses.

—	B. Sc.	I. Sc. 1.	I. Sc. 2.	I. Sc. 3.	TOTAL.
1909 . . .	12	4	1	11	28
1910 . . .	4	4	13	6	27
1911 . . .	8	7	11	2	28
1912 . . .	7	6	13	1	27
1913 . . .	12	9	11	..	32
1914 . . .	8	13	3	..	24
1915 . . .	7	19	..	..	26
1916 . . .	3	19	3	..	25

Owing to the want of suitable previous training at schools and colleges it has not been found possible to introduce a shorter period of training at Sibpur for B. As. or B. Scs. An experiment in this direction was made in 1890 to 1900 but was abandoned; the results obtained in no way justified the extra strain on our teaching staff.

Age-limits.—The falling off in the number of B. Scs. I am now admitting to Sibpur is not due to any falling off in the number of applicants but to the effect that the new regulations of the University matriculation have in raising the age of lads on passing the B. Sc. The regulation prevents a lad under 16 years of age appearing at the matriculation examination.

It came into force at the matriculation examination of 1910.

Will first affect I. Sc., at the matriculation examination of 1912.

Will first affect B. Sc., at the matriculation examination of 1914.

As regards Sibpur—

Will affect I. Scs. admitted in 1912 leaving in 1916 and after.

Will affect B. Scs. admitted in 1914 leaving in 1918 and after.

This means that students on completing the full college course of training and obtaining their full college diploma of civil engineer must be at least in case of—

	Years.	Months.
I. Sc.	23	9
B. Sc.	25	9

that is, presuming that they joined Sibpur as young as possible and that their births had occurred in the most favourable month of the year.

Our present age regulations for admission to Sibpur lay down—

- 21 years on 1st January for an I. Sc.
- 23 " " " " a B. Sc.

They may take six years in completing the full B. E. course and yet be eligible for the Assistant Engineer's post, adding in the subsequent one year of practical training we find that an I. Sc. may be 28 years of age, and a B. Sc. may be 30 years of age on becoming eligible for an Assistant Engineer's post, or actually 28 years 9 months and 30 years 9 months, because we admit in November and not in March with reference to which month the University calculates their ages.

The youngest Assistant Engineer would be 23 years 9 months.

The oldest Assistant Engineer would be 30 years 9 months.

For the above reasons of age I have advised government not to admit any student to the Engineer Department

of this college as a competitor for government employment whose age exceeds 21 years. The limits would then be 23 years 9 months to 28 years 9 months. Of course another way to prevent Assistant Engineers joining government service at an advanced age would be to apply rigid rules as regards age on admission to government service, but I don't like this. There is too much "age twisting" at present going on in Bengal.

I made an analysis based on the results of the matriculation examination of 1914 and found that 44 per cent. of the candidates appearing at that examination were declared to have been born in the first quarter of the year. The figures being:—

1st quarter	44
2nd "	20
3rd "	20
4th "	16
TOTAL	100

I do not think that medical men can find any physiological reason for these figures, especially as regards the difference between the first and fourth quarters of the year.

Exclusion of B. Scs.—It now becomes of importance to estimate the effect upon the efficiency of the college if we decide to exclude B. Scs. It is unfortunate that a longer interval of time has not passed since the new courses were introduced, but from the figures that I have I get the results on the following table, from which we gather that the extra training a B. Sc. has had before joining Sibpur does not justify us in keeping our doors open for B. Scs.

We may well rule that no student over 20 years of age shall be admitted to the college. The greater age of the B. Sc. and their longer Arts college training may well make them less keen for outdoor exercise and less adaptable.

A larger proportion of B. Scs. are likely to be married.

Comparative efficiency of B. Sc. and I. Sc.

Based on examination.	B. Sc. two or more years older than I. Sc.	I. Sc. 1.	I. Sc. 2
	Per cent.	Per cent.	Per cent.
6 (1911-1916) 1st year	97	84	46
5 (1912-1916) I. E.	60	57	20
4 (1913-1916) 3rd year	74	86	75
3 (1914-1916) B. E.	60	63.3	66.6
Average all examinations	73	72	40

The following fact points to the same conclusion, namely, that never once since 1905 has the guaranteed post been won by a B. A. or B. Sc. at the practical examination conducted by the Public Works Department on the completion of practical training.

Examinations.—The college prepares students for the university examinations which are as follows:—

(1) Intermediate Engineering at the end of second year.

(2) Bachelor of Engineering at the end of fourth year.

The examinations at the end of the first and third years are conducted by the college staff.

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[Continued.]

The following are the schedules (pass marks are shown in brackets) :—

	College, I Engineering.	University I. E.	College, III Engineering.	University B. E.
Mathematics.	Computations } 100 Mensuration } Statics } 150 Dynamics } Calculus } 150 Plane Geometry } 400 (160)	Computations } Mensuration } 400 Statics } Dynamics } Applied Mechanics 500 Analytical Geo- metry and Cal- culus } 300 1,200 (400)	Theory . . . 100 Applications . . . 150 250 (100) Applied— Mechanics I . . . 100 „ II . . . 100 Laboratory work . . . 50 250 (100)	Theories . . . 200 Applications . . . 300 500 (167)
Science	Chemistry (Theory) 100 „ (Practical) 100 Physics (Theory) . 100 „ (Practical) 100 400 (160)	Chemistry (Theory) 250 „ (Practical) 250 Physics (Theory) . 250 „ (Practical) 250 1,000 (334)	Metallurgy (Theory) 100 „ (Practical) 100 Applied Physics 100 Physics (Practical) 100 Geology . . . 100 500 (200)	Geology and Minera- logy . . . 200 Metallurgy and Test- ing Theory . . . 200 Applied Physics . 200 Practical Engineer- ing Physics . . . 400 1,000 (334)
Drawing and Estimating.	Drawing (Theory) . 75 „ (Practical) 75 Estimating . . . 50 200 (80)	Drawing (Theory) 200 „ (Practical) 300 500 (167)	Engineering and Architecture . . . 100 Graphics and Prin- ciple of Design . . . 100 200 (80)	Drawing (Theory) . 200 „ (Practical) 250 Attested Design . 450 900 (300)
Engineering .	Engineering . . . 100 Surveying . . . 100 200 (80)	Materials . . . 400 Details of Construc- tion . . . 400 Estimating . . . 200 1,000 (334)	Roads and Buildings 100 Irrigation . . . 100 Engineering and Machinery . . . 100 300 (120)	Roads and Railway 400 Irrigation and Sani- tary Engineering . 400 Applied Mathematics 400 Hydraulics . . . 400 Engineering and Machinery . . . 400 2,000 (667)
	Total Theory . 1,200 (480)	Surveying . . . 200 Field Work . . . 300 500 (167) Total Theory . 4,200 (2,100)	Session Work Drawing . . . 200 (100) Field Work . . . 300 (150) Grand Total . . 1,950	Total . . . 4,400 (2,200) Over 2,934, 1st Division. Remainder, 2nd Division.
Workshop	Carpentry . . . 1,000 (500)	Carpentry . . . 1,000 Smithy . . . 1,000 2,000 (1,000)	—	—

The following is an analysis of examination results :—

YEAR.	1ST YEAR.		I. E.		3RD YEAR.		B. E.	
	Appeared.	Passed.	Appeared.	Passed.	Appeared.	Passed.	Appeared.	Passed.
1911	29	19	33	11	21	21	14	13
1912	30	23	31	30	14	13	19	16
1913	30	19	24	11	26	20	16	10
1914	33	26	28	5	20	10	25	10
1915	20	17	41	15	8	6	26	22
1916	24	19	35	13	17	16	11	6
TOTAL	166	129	192	83	106	86	111	77
	78 per cent.		43 per cent.		83 per cent.		70 per cent.	

Per cent.

The required percentage to satisfy the Examiners at { College Examination 40 } 40
 { University Examination 33 } 50

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[Continued.]

I prefer the college practice. The effect of the university practice is that many candidates fail in the total whom examiners consider fit to pass in the particular branch in which they have been examined. Students also are inclined to spend time on their strong subjects to

score marks to help them in the total, while with a flat rate they will devote themselves to their weak subjects. The following table shows the percentage of failure in the various subjects at college and universities :—

Including 1911.	I.—Engineering.	I. E.	III.—Engineering	B. E.
	College.	University.	College.	University.
Percentage of marks required to pass.	40 per cent. in each group. 40 per cent. in total.	33 per cent. in each group. 50 per cent. in total.	40 per cent. in each group. 40 per cent. in total.	33 per cent. in each group. 50 per cent. in total.
	Per cent.	Per cent.	Per cent.	Per cent.
Group—Mathematics	14	..	8	about 1
Applied Mechanics . . . . .	..	..	17	..
Science	14	5	..	..
Drawing and Estimating	6	..	2	..
Engineering . . . . .	..	18	6	Eng. & App. about 1.
Surveying . . . . .	..	½	..	..
Total . . . . .	..	55	..	30
Total only . . . . .	..	32	..	24
Workshop	Carpentry 11	Smithy 12 College Test.	..	..

1,887. *The value of the connection with the University.*—The connection with the University, as it is at present constituted, has merely a *window dressing* value, while it has several obvious disadvantages.

By *window dressing* I mean that the fact that we give a B. E. degree is a decided attraction to the Indian student who thinks more of having an alphabet after his name than of being an efficient engineer; this does possibly attract a student who has reached a more advanced stage in his education; whether this has a real value is a moot point. Statistics of the comparative efficiency from an engineering college point of view of B. Sc. and I. Sc. students will be found elsewhere; these show that the B. Sc. has no better record.

There is no university life of any description in connection with the Calcutta University which the Civil Engineering College can join either for professors or students. For all practical purposes the University is merely an *Examining Board*. Any other Board of Examiners could do the work as well and perhaps more efficiently if they were given greater control over the syllabus of instruction and scheme of examination. The Calcutta University can never obtain the confidence of engineers or other employers of our students.

The chief energies of the University are taken up with the control of schools and of the arts, science and law courses and examinations. In regard to these the discussions are interminable and inconclusive, and I cannot imagine any practical man having the necessary time and patience to give to university business.

My own experience is that the time I spend at the University is absolutely valueless for all the good the college may benefit. I have to give up one or two afternoons a week to Syndicate, Faculty or Senate business at which only perhaps 1 item in 1,000 remotely concerns engineering. The meetings last from 3 to 4 hours and the time would be to far greater advantage spent either at the college or in keeping touch with practical engineers, the future employers of our students.

It should here be noted that in consequence of a difference of opinion regarding the conduct and standard of the university examinations in engineering that occurred during the principalship of Mr. S. F. Downing, the Government of Bengal have definitely reserved the right to cut off all connection with the University and to substitute an examination conducted by the staff of this college instead of the B. E. in connection with the award of the guaranteed post of Assistant Engineer.

This right lies dormant and has never yet been exercised.

1,888. *Practical training and employment.*—There are ample opportunities for the suitable practical training of Assistant Engineers in India, but the prescribed period of one year is too little to enable the student engineer to get adequate experience or for the Executive Engineer under whom he is placed to form a reliable opinion as to the professional capacity.

Practical training is not confined to the Public Works Department. Three B. Es. yearly are taken for training by the Sanitary Engineer and students are also posted under railways, municipal engineers and Calcutta port extension works. The Public Works Department will admit to the practical examination at the end of practical training for the Assistant Engineer guaranteed post competition the first six B. Es. who have passed within six years of joining college irrespective of where they have received their practical training. Students generally prefer practical training under the Public Works Department.

It is difficult to arrange for a more prolonged period than one year. Indian students can't afford to remain long unemployed; they are given stipends to provide for their maintenance during this period. The present practice of appointing student engineers to permanent and pensionable positions under government at the end of one year complicates the position. In my opinion there is no necessity to appoint a man so soon to a permanent pensionable post. Non-government employers pay their men at their market value and engage them on a purely temporary basis. There appears to be no valid reason why government should both pay their Assistant Engineers above their market value and also give them a permanent tenure of their posts at so early a stage before they have definitely proved their practical capacity. If the selection of Assistant Engineers for permanent employment be postponed until they have reached the Executive Engineer stage or at least for five years, then government could afford to engage more. Many an upper subordinate is now employed upon work that used to be the charge of an Assistant Engineer. Perhaps in Bengal this may be because about half of the upper subordinates have Assistant Engineer qualifications, but they are treated as subordinates. The number of Assistant Engineers may well be increased and more may be engaged if they are employed on a temporary basis.

Lads so employed will get an extremely useful experience; if they are not eventually engaged by government on the permanent staff, they should find ready employment outside and will be suitable material for employment by district boards and municipalities.

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[Continued.]

To make such a scheme a success those who show themselves unfit either as engineers or for positions of responsibility and trust should be weeded out at an early stage. There is not the same necessity to engage Bengali engineers who are serving in Bengal on the same terms as Europeans, who have to be tempted to foreign service, who by accepting it lose their home connection and who if they returned from India have to start again at the bottom of the ladder.

The cry of Indians for increased employment under government would make a far stronger case if they pointed out that they can afford to accept a lower scale of pay than Europeans, because they are serving in their own country and need not send their wives and families to England.

They can point out that private employers pay them less, and that their education has cost them far less. Therefore, that it might be economical to employ a larger number of Indians.

1,889. *The course of study in the Engineering Department.*—In considering the course of study one has to consider first the idiosyncrasies of the student material we have to work upon.

The Bengali student is naturally of a dreamy philosophical nature, given more to the consideration of

abstract problems; this tendency is perhaps why he is attracted to law. In a civil engineer a very different type of man is needed, a man fond of and keen on a strenuous outdoor life, a man who has to deal with the forces of nature. We have therefore continually to accentuate the practical as opposed to the theoretical side of our studies.

We have to bring the Bengali student from dreams of the abstract to the practice of the concrete, a complete reversal of his nature which we have not even yet accomplished, for it is said that he still prefers the office chair to the saddle, life at his home to life in camp.

A study of the accompanying analysis of our routine of work will show the amount of time devoted each year to practical field work conducted under canvas during the cold weathers in Purulia, an undulating district. Also the time devoted to workshops and to practical work in the laboratories. The workshop course is not included in the University syllabus; it has been deliberately excluded, because that body has no real connection with practical engineering and the standard of the course has to be maintained with reference to the Public Works Department practical examination held at the end of practical training to determine the award of the guaranteed Assistant Engineer post and to fill vacant posts in the overseer grades.

1,890. *Analysis of routine.*—

Hours per week.

	Weeks.
Session—including field works	22
Examination and preparation	7
Holidays	23
Total	52

CLASS.	Portion of session allotted to field work.	MATHEMATICS.		CHEMISTRY.		PHYSICS.		Geology and Mineralogy.	Engines and Machinery.
		Lecture.	Mechanics Laboratory.	Lecture.	Laboratory work.	Lecture.	Laboratory work.		
1st year	1 month	4	1½	4	3	3	3	..	..
2nd "	6 weeks	5	1½	4	3	3	3	..	..
3rd "	6 "	5	1	1	3	2	3	1	2
4th "	Nil	2	..	..	..	2	3	1.	2

CLASS.	Electrical Engineering.	CIVIL ENGINEERING.		Architecture.	Drawing.	WORKSHOPS.		TOTAL.	
		Lecture.	Project.			Carpentry.	Smithy.	Section including drawing.	Practical including project.
1st year	..	2	..	..	11	10½	..	24	18
2nd "	..	5	..	..	7	..	7½	24	15
3rd "	2	4	13	1	See Project	..	..	18	20
4th "	2	5	19	1	See Project	..	..	15	22

Visit to works.

1st year	} Lime kilns—Brickfields	} Visit Geological Section of Indian Museum once a month on Saturday afternoon.	
2nd "			
3rd "			Geological excursion
4th "			Irrigation, Buildings, Railway Bridge

The examination syllabus laid down by the Calcutta University to train students for which we have to arrange our course of study is now under revision. It was devised when the University was reorganized by Lord Curzon in 1905 at the time when all other courses were also being overhauled. As no one could foresee how the other courses which are preparatory to ours would develop or the comparative popularity of the Arts and Science courses, and it was necessary when drawing up the engi-

neering courses to provide for the admission of students after either the Inter Arts or Inter Science examination, we prescribed that candidates for admission must take English, mathematics and chemistry or physics and in addition we held an examination test of our own in drawing.

The admission of lads who had taken either no chemistry or no physics meant, since no form of elementary science is included in the matriculation syllabus, that

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we had to teach for most the elementary stage of both sciences. This threw a lot of work on the college staff. On reference to the table showing the qualifications of students admitted each year, it will be seen that I have for some years been able to confine my admissions to Inter Science lads taking those who have passed in both chemistry and physics and largely those in the first division. The college accordingly asked the University to reconsider the examination syllabus so as to enable us to recast our teaching arrangements. Our proposals have been accepted and are now before government. Shortly they amount to this,

- (a) to complete the course in chemistry at the I. E. stage end of the second year ;
- (b) to complete the course in physics at the end of the third year ;
- (c) to complete the course in mathematics at the end of the third year ;

which will enable us for the first time to devote the fourth or final year of the Bachelor course entirely to professional subjects. At the same time we have made arrangements to enable students to "unload" some of their subjects at the end of the first year and to thus lighten the I. E., the marks being carried forward and again to unload subjects at the end of the third year to lighten the B. E., marks again being carried forward. We hope to receive the sanction of the Government of India to these shortly and to introduce them from November 1917, thus first affecting the B. E. of 1921.

Students are allowed to take six years to complete the four-year B. E. course and still to retain their status as regular students since the introduction of the new B. E.

One-third of the successful B. Es. have passed through the college without failure. Of 34 students who had not so passed there were—

3 failures in 1st year.	19 failures in 3rd year.
15 failures in 2nd year.	13 at B. E. examination.

Students are allowed to take six years to complete the four-year B. E. course and still to retain their status as regular students and their right to compete for the guaranteed post. This means that in each year we find a certain proportion of repeating students. This proportion since the introduction of the present course is as follows :—

1st year 14 per cent.	3rd year 21 per cent.
2nd „ 36 „	4th „ 24 „

The average time spent by a successful student on the four-year course is five years. The repeating students do not as a rule appear to benefit by the extra time they are able to spend on their studies, for the proportion of successful students appearing for a second or subsequent time at an examination is no higher than amongst those appearing for the first time.

The college histories of the students who have obtained the guaranteed post since 1904 and their educational qualifications on admissions are shown in the following table :—

College history of Assistant Engineers since appointment made on Purulia examination.

Year	Name	Position at B. E.	Years to complete course.	Examination in which he failed.	REMARKS.
1904	Manindra Nath Deb, B.A.	2-13	3	Nil	Admitted to second year.
1905	Sailendra Nath Banerji, B.A.	2-10	3	Nil	Ditto. ditto.
1906	H. C. Vieyra, F.A. 2	3-7	4	Nil	
1907	Khired Chandra Sen, F.A.	2-9	6	Absent B. E.	
1908	P. H. Barboza, F.A., 2 (1)	3-14	6	II and III	Fail r. z.
1909	Benoy Ranjan Haldar, F.A. 3 (2)	6-11	4	Nil	
1910	Sanat Kumar Roy, F.A. 2 (2)	6-14	4	Nil	
1911	Adya Nath Bose, F.A. 2 (1)	2-6	4	Nil	
1912	A. J. King, F.A. 2 (1)	2-12	4	Nil	
1913	Probhat Chandra Roy, F. A. 2 (2)	2-13	5	III.	
1914	Kumud Bhusan Roy, L.A. 1 (1)	1-10	4	Nil	
1915	Debendra Nath Sen Gupta, F.A. 1 (2)	4-16	5	III.	
1916	Suresh Chandra Chatterji, I. sc. 1 (2)	2-10	4	Nil	
1917	Hari Prasad Barua, F. A. 2 (2)	1-21	8	I, III, B. E. and B. E.	An Assam student.
	Ananta Kumar Dutta, I. sc. 1 (2)	6-21	4	Nil	Passed first at Purulia examination, no appointment available.

Not once in the last 12 years has the guaranteed post been awarded to a B. A. or B. Sc. This seems to point to their want of adaptability.

1,891. *The award of the guaranteed post of Assistant Engineer.*—Previous to 1904 the award was decided on the position of the student on the order of merit at the B. E. By Bengal Government Resolution No. 1252-E. of 30th May 1910, the procedure was changed. The Public Works Department were not satisfied that they were obtaining the most capable student by an examination confined to theoretical subjects and they ruled that the award should be made on the result of a practical examination conducted by themselves on the completion of the one year of practical training. The same examination was utilized for the award of overseer posts.

Students of the Apprentice Department were then admitted for the first time to the competition for the

overseer posts, those who had obtained the full course upper subordinate certificate awarded on the satisfactory completion of the practical training that follows the overseer examination being posted to the 2nd grade of overseers, while those that joined practical training directly after passing the overseer examination were posted to the 3rd grade. Under these rules students of the Bihar School of Engineering were admitted and were eligible for 3rd grade overseer posts till 1912, when the status of the school was raised, the practical training in their workshop being recognised.

In 1911 passed students of the Dacca School of Engineering were first admitted to the competition, the status of that school having been raised to the full upper subordinate standard in 1909. The Public Works Department examining board consisted of one Superintending and two Executive Engineers.

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The schedule of marks at this examination for deciding both the Assistant Engineer and the overseer posts was as follows :—

	Marks.	Marks.	Practical tests—	Assistant Engineer Schedule.	Overseer Schedule.
				Marks.	Marks.
Practical tests—			Levelling and surveying	250	250
Levelling and surveying	250		Engineering	250	250
Engineering	250		Preparation of materials	250	250
Preparation of materials	250		Accounts	250	250
Accounts	250		Drawing	250	250
Drawing	250		Estimating	250	250
Estimating	250		Riding	250 (a)	250 (a)
Riding	500		Handicraft	500 (b)	1,000 (b)
Handicraft	2,000				2,750
	1,000	(result of college handicraft examination).	Marks gained in engineering subjects at B. E.	1,000	
				3,250	
GRAND TOTAL		3,000			Assistant Engineer competition.
					Overseer competition.

The B. E. students being of opinion that they were under a disadvantage in the competition with the upper subordinates owing to the latter having had a previous period of practical training and it being also decided to give some value to their theoretical knowledge as regards the competition for the Assistant Engineer's post, a change was made in 1911 and a new schedule adopted for the award of the Assistant Engineer's post, the marks being as follows. At the same time it was decided to replace one Executive Engineer by a Professor of Civil Engineering from Sibpur.

(a) Reduced from 500.
(b) Reduced from 1,000.

An analysis of the results of this examination will be found very interesting. Please see the following tables which show the relative position on the order of merit of B. Es. and of students of the other classes :—

Upper Subordinate from Sibpur being shown as S
" " " Dacca " " D
" " " Bankipur " " B

Order of merit at Public Works Department practical examination.	COMPETITION FOR ASSISTANT ENGINEER AND OVERSEER POSTS.									COMPETITION FOR OVERSEERS ONLY.				
	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	
	1	B. E.	S.	B. E.	B. E.	B. E.	B. E.	B. E.	B. E.	B.	B. E.	B. E.	B. E.	B. E.
2	B. E.	S.	B. E.	B.	B.	B. E.	B. E.	S.	D.	B. E.	B. E.	B. E.	B.	
3	B. E.	B. E.	B. E.	B. E.	S.	B.	B.	B. E.	S.	B. E.	S.	S.	D.	
4	B. E.	B. E.	B. E.	S.	B. E.	B. E.	S.	B. E.	B.	B. E.	B. E.	S.	B. E.	
5	S.	B. E.	B. E.	B. E.	B. E.	B. E.	B. E.	B. E.	D.	B.	D.	B. E.	B. E.	
6	S.	B. E.	B. E.	B. E.	B. E.	B. E.	B. E.	B. E.	S.	B. E.	B. E.	B. E.	B. E.	
7	B. E.	S.	B. E.	B. E.	B. E.	S.	B. E.	B.	B. E.	D.	B. E.	B.	D.	
8	B. E.	B. E.	S.	B. E.	B. E.	B. E.	B. E.	B. E.	S.	B. E.	B. E.	B. E.	S.	
9	S.	B. E.	S.	B. E.	S.	S.	S.	D.	B. E.	D.	B. E.	S.	B. E.	
10	S.	B.	S.	S.	S.	B. E.	B.	D.	B. E.	B. E.	B. E.	D.	D.	
11	B.	S.	S.	S.	S.	S.	S.	S.	B. E.	S.	B.	B.	S.	
12	..	..	..	..	..	S.	S.	S.	S.	..	B.	D.	B. E.
13	..	..	..	..	..	..	..	D.	D.	..	B. E.	D.	B. E.
14	..	..	..	..	..	..	..	..	..	..	D.	B. E.	..

Order of merit at Public Works Department practical examination.	ORDER OF MERIT AT B. E.										NEW SCHEDULE FOR ASSISTANT ENGINEER POST				
	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.		
	1	2	3	2	2	6	2	2	2	2	4	(1)	2	3	
2	4	6	4	3	3	4	(1)	(1)	4	(1)	3	3	5		
3	(1)	2	6	4	(1)	(1)	3	3	(1)	3	2	(1)	4		
4	6	1	1	7	2	3	4	3	5	2	4	5	2		
5	3	4	3	5	5	5	6	4	3	6	5	6	6		
6	6	5	5	(1)	2	6	5	6	..	5	7	4	No. 1 absent.		

Guaranteed posts were as follows :—

Once, by student who passed B. E. 1st on list of merit.

Eight times, by student who passed B. E. 2nd on list of merit.

Twice, by student who passed B. E. 3rd on list of merit.

Once, by student who passed B. E. 4th on list of merit.

Once, by student who passed B. E. 6th on list of merit.

No guaranteed post was available for competition in 1916.

This method of deciding the award was adhered to by the Province of Eastern Bengal and Assam as regards Assistant Engineer posts in their Public Works Department during the existence of that province. Since 1912 when it ceased to exist and Bihar and Orissa was formed the latter province has given the cold shoulder to Sibpur and in the Calendar of the Thomason College, Roorkee, the following remarks will be found :—

"Recruitment for the Provincial Engineering Service in Bihar and Orissa will in future be made from this college and students may elect for service in those provinces. No alteration will be made for the present in the annual rate of recruitment from this college."

Bihar and Orissa, however, still ask the Bengal Government to retain four vacancies here yearly in the

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Engineer Department for students from that province and they give a special scholarship for Oriyas. They also co-operate in the conduct of the practical examination and send their students to it from the Bihar School of Engineering. It has not yet been decided whether in the event of a Bihar and Orissa B. E. sent here by that government heading the list at the Purulia examination, the Bihar and Orissa Government will admit him to their provincial Public Works Department or what claim he may have as regards the Bengal Public Works Department.

Students from Burma and Assam are also sent here to read in the Engineer Department as regular students and to qualify themselves for posts in the Assam and Burma Public Works Department. The award to these posts is made on the results of the B. E. under the original orders of the Government of India. It would be difficult to conduct a fair examination after practical training in the varying conditions of Assam, Burma, Bengal, Bihar and Orissa.

MR. B. HEATON called and examined.

1,892. (*President.*) The witness who was the Principal of the Sibpur College stated that, for the engineering class, he recommended a maximum age-limit of 20 years with an intermediate science standard of education, and for the upper subordinate class an age-limit of 19 years with whatever educational qualifications he could get, matriculation or above; at present he was getting students who had passed the intermediate in science.

1,893. The age-limit at Roorkee for upper subordinates was 22 years. At Sibpur, although the rules laid down 17 years, he actually admitted them at the age of 18 years. The minimum as regulated by the University rules for the matriculation examination was 16 years. He wished to raise the age-limit for his upper subordinate class to 19 years because he wanted to obtain students who had a somewhat better knowledge of mathematics than that prescribed by the matriculation. He had a large number of matriculation students, but would like to be able to give others also a chance of entering the college. A very large number of Bengali students did not determine what profession they would follow until they had passed through the intermediate science stage and he thought that selection would be unduly limited if these were entirely excluded. The class of students he obtained at 18 years of age was not really sufficiently good for the upper subordinate class and from the guardians' point of view it was rather rough to exclude an intermediate science man entirely. He explained that boys went to college and wished to see the intermediate science course through and it was only then as a rule that they began to think what they would eventually become; it was a pity to make them break off in the middle of their intermediate science stage. A boy must be over 16 years of age when he passed his matriculation. By age-limit he meant age last birthday.

1,894. There were separate classes at Sibpur for training Assistant Engineers and upper subordinates, and one annual guaranteed post was attached to each class. In the case of the Assistant Engineer class, this took the shape of an Assistant Engineer's post awarded alternately in the Bengal Public Works Department or on State Railways. In the case of the upper subordinate class a 3rd grade overseer post on State Railways was given, which he believed to be guaranteed. He would prefer that upper subordinates should be recruited from the upper subordinate class because the syllabus of instruction in that class was designed for the production of upper subordinates, while the Bachelor of Engineering class was designed to produce Assistant Engineers. He regarded the filling of upper subordinate vacancies by men of the engineering class as abnormal; Assistant Engineers were not designed for that purpose but undoubtedly the struggle for a living now-a-days was very hard. The Sibpur College turned out an average of 11 Bachelors of Engineering annually and they had to take up posts as upper subordinates in order to earn a livelihood. His impression was that the Public Works

In 1915 an Assam student headed the list at the B. E. and the Government of India have decided that no guaranteed post is to be awarded on the results of the practical examination held on completion of practical training. This has naturally produced discontent amongst the Bengali students who would have had their chance had the Assam student passed second or in any other place than first.

Since Bihar and Orissa have decided to recruit from Roorkee and the needs of the smaller Bengal as regards recruiting are one-half, what was the case when Bengal and Eastern Bengal and Assam existed? Bengal now needs one Assistant Engineer every second year instead of one yearly. The Government of India have decided in order to safeguard the guarantee that a B. E. shall be posted to Railways in the year in which Bengal does not take any. The selection is made on the result of the practical examination at Purulia.

Department took advantage of the situation and entrusted the upper subordinates with duties which used to be undertaken by Assistant Engineers and that 25 to 30 years ago a large number of sub-divisions, now held by subordinates, were held by Assistant Engineers. He admitted that the upper subordinate was intended to be the regular sub-divisional officer and that the Assistant Engineer when holding such a post was merely undergoing a period of training for the post of Executive Engineer, but thought none the less that upper subordinates were more relied upon than formerly and that they had to do more designing than was the case in the past.

1,895. He recommended that the best course for the Sibpur College to adopt would be to abolish the lower subordinate class altogether. As to the training of such men in that event, he explained that there were a large number of schools for the purpose, such as those at Dacca (where there was also an upper subordinate class which corresponded to the Sibpur class), at Burdwan, Rajshahi, Pabna, and Comilla, while classes had also been held at Barisal, Rangpur and Midnapur. Dacca was a government school but the remainder were mostly district schools under district boards. He used to inspect these schools every year, and thought that they could be greatly improved and made satisfactory training grounds for lower subordinates. He would rather see government take over one or two such schools and make them thoroughly good, that is to say centralize the training, rather than leave it to district boards. Personally he was in favour of the abolition of the distinction between upper and lower subordinates and the establishment of a single subordinate service, in which event the lower subordinates at present under training would find situations with district boards and municipalities. At present the trouble was that if one of his students secured an appointment in the lower subordinate grade of the Public Works Department, he felt that he would always remain a lower subordinate. He understood that promotions from the lower to the upper subordinate grade were not very frequent and that once a man accepted a position as a lower subordinate he stamped himself as such. He had not studied the scheme outlined by the Public Services Commission for the reorganization of the Public Works Department, but explained that Bachelors of Engineering were forced to accept posts as upper subordinates because there were not enough posts as Assistant Engineer available, and by doing so these men also felt that they stamped themselves more or less permanently as subordinates. Since the creation of the Province of Bihar and Orissa only one promotion had been made from the upper subordinate to the officer grade and this appeared to him to be a breach of guarantee. It was only an exceptional man who could hope for selection. The only outlook these men had after 5 years' satisfactory service in the upper subordinate grade was that they might possibly be selected for a district engineer's appointment. There

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were no reasonable prospects of advancement through district boards to anyone who had not influence with the board. The selection for district engineers' posts was in the hands of members who did not award them, he believed, on merit only.

1,896. The course of practical training in connection with the Sibpur College course extended over a period of one year which was too short either for the students, to develop their capabilities, or for the officers to form any opinion of them. He recommended that this period should be extended to two years. A certain number of students at present received practical training on the railway and in the Public Works Department. Some of his students had also received practical training with Messrs. Burn and Company from whom he had received very good reports of them. He had posted two students to the Calcutta Port Improvement where they were working under the contractor. One of his students had been working under the Howrah Municipal Engineer, and every year the Sanitary Engineer of Bengal took three students for practical training. As already stated the average number of Bachelors of Engineering produced annually by the Sibpur College was 11, while there were 13 practical training scholarships available, and he found no difficulty in obtaining such training for his students, nor did he believe that even if the practical course were extended to two years there would be any difficulty in finding situations for them. No reports as to the quality of the practical training given to graduate students of the Engineer Department were submitted to him, but in the case of the upper subordinate class students such reports were received. He did not know what the B. E. students did nor was there any inspection of their training from the college point of view although that training was necessary for the college diploma. They had to be trusted implicitly as their work was checked only at the end of the training. The college took part in the practical training examination held at the end of practical training after which the award of the guaranteed post was decided, the Professor of Civil Engineering being a member of the board of examination, and to that extent the college was in touch with the students. He was more closely in touch with the upper subordinates because ordinarily he himself was supposed to have their practical training carried out in the college, and it was only in exceptional circumstances that such students went away for practical training. Formerly the year's practical training for upper subordinates had always been carried out in the college workshops but at present a certain number were trained outside. He looked upon outside training as rather a privilege and seeing that he remained directly responsible for it he insisted that students should send in their monthly note books to him which were sent back to them after criticism.

1,897. He was of opinion that, in some ways, practical training in the college workshops was more suitable than outside training, as the students were not separated. There was work on a sufficiently large scale in the college workshops for a limited number of students. He had always a fair number of schemes under preparation and the students, who worked directly under him, were employed in his office in drawing up projects. He thought a year or six months in the college workshops followed by a year or eighteen months on works would be an excellent thing.

1,898. (*Sir Noel Kershaw*.) One of his students who had received practical training with Messrs. Burn and Company had, at the conclusion of such training, been employed by the firm having proved himself a very useful man. The witness had seen his note books which were absolute models. Another student had received practical training with the firm who were constructing the harbour works. A third student who had proved unsatisfactory when undergoing practical training, and who had not been employed at the conclusion thereof, had since disappeared. He thought the employment of students would develop in time and that Messrs. Burn and Company would undoubtedly employ even more up to three or four if they were available. He was certainly of opinion that, ultimately, the system of

appointing men, who had received practical training with large firms, direct to government posts would be adopted. Personally he thought such a system would improve the class of students as they would know that they would first have to prove themselves efficient engineers. He did not think it would reduce the number of really capable students entering the college.

1,899. (*Mr. Mackenzie*.) The majority of the ex-students of the engineering class in the Thomason College, Roorkee, were able to obtain employment as officers, while at Sibpur and he believed at Madras and Poona also the majority of the students had to seek employment in subordinate positions. He explained that this state of affairs was due to the Thomason College having six or seven appointments guaranteed annually while the other colleges had one only. Other posts were also given to ex-students of the Thomason College but this did not limit the number of men who were appointed as Assistant Engineers. For each guaranteed appointment two students were sent from Roorkee for practical training one of whom was chosen for a permanent post while the other was often taken on as a temporary hand. It was seldom that Sibpur B. Es. secured such temporary posts. He knew of a case in which a lad posted to the Bengal Nagpur Railway for practical training had been offered employment by that railway and who eventually rose to be an Assistant Engineer; he added that the proportion of Indians turned out from the engineer classes at Sibpur was far greater than at Roorkee.

1,900. He would like to see the present system of guaranteed posts done away with as regards definite colleges and would prefer that a system should be substituted under which when an Indian was to be appointed to the superior service in any province a native of the province concerned should get the preference. He explained that by 'Indian' he meant statutory Indian. He also suggested that in selecting Indians for the superior service no special preference should be shown to the students of any one college; he certainly did not wish that, because a man had been trained at Sibpur, he must therefore be appointed regardless of whether there was a better man available from elsewhere or not.

1,901. The sons of men engaged as contractors did not at present enter the college, and he thought that the conditions of living there were to some extent responsible for it; something should be done to attract such men. He believed that at Roorkee the students were more or less forced to live in good style and that the members of the staff occasionally dined with them. As far as the engineering class was concerned the college did not admit quite so many students as was formerly the case when the number was 40 compared with 24 at the present time, but the same average number of students passed through the college. The reason for this was due to changes in the barracks whereby fewer sets were available for engineer students. The proportion of scholarships was of course higher amongst 24 than amongst 40. He believed that there were more scholarships available in Sibpur than in other colleges but a scholarship was a very good thing for the encouragement of poor boys. He thought it would be a sound proposition to limit the number of scholarships to 25 per cent. of the students and to raise the fees for tuition.

1,902. He explained that the apprentice department consisted of classes for upper and lower subordinates. The apprentice system was in existence at Dehri-on-Soane before the Sibpur College was founded, after which these apprentices were transferred to the latter college. It was really only apprentice in name, and indentures were not now signed.

1,903. Owing to the want of suitable previous training at schools and colleges it had not been found possible to introduce a shorter period of training at Sibpur for Bachelors of Engineering and Bachelors of Science. An experiment in this direction had been made in 1890 to 1900 but it had proved a failure and had had to be abandoned. They had tried to include in the first year the second year's course in professional subjects but had failed to do so. It was the custom in Bengal for students to be allowed to sit for the Bachelor of Engineering

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examinations two or three times appearing occasionally as *ex-students*, but they could not remain at the college for more than three years to complete the last two years of the B. E. course. This procedure was, he believed, not followed at Roorkee. It was not a good thing because boys who were very keen on getting guaranteed posts sometimes gave up in the middle of an examination and after a year's further work appeared again and so made sure of finally passing the examination in that way, and securing a better and higher position than those who passed through without such repetition.

1,904. (*Rai Bahadur Ganga Ram.*) He was allowed to undertake work in the college workshops provided he received payment for such in advance.

1,905. An examination in drawing was held for admission into the engineering department. There was a *mistri* class in the college workshops for which boys were taken at the age of 13 or 14. He had not considered the question whether advertisements in regard to these *mistris* should be circulated with a view to their obtaining employment in the Public Works Department.

1,906. Engineers and upper subordinates at the Sibpur College messed together, the former living in a sort of double room with eight students in each. There was no cubicle system at the college.

1,907. (*Mr. Cobb.*) He would draw a definite line between subordinates and the upper service but would provide the former with more suitable prospects. He did not contemplate giving subordinates a very advanced

training in science or mathematics, and such men would have to be uncommonly good to justify their appointment to the upper service.

1,908. He was not contented with the present organization of the classes for the training of sub-overseers. The business of co-ordinating the work of these classes was entrusted to a Board of Examination, which also controlled the syllabus. At the present time a proposal was under consideration for the revision of the syllabus for upper and lower subordinates.

1,909. (*Mr. Green.*) He considered that district boards and municipalities did not offer sufficient prospects to induce upper subordinates to join them. The pay offered by these bodies was sometimes as low as Rs. 15 per month to begin with and hence upper subordinates would not apply for such posts. He was considering the question of the training of sanitary engineers. There was a great demand for such men and under rule no one could be received for training as a sanitary inspector unless he had passed as a sub-overseer. There was a large demand for such inspectors quite apart from the Public Works Department.

1,910. (*President.*) He thought the standard of training and education in the Bachelor of Engineering course at Sibpur was superior to that given at the Roorkee college because Sibpur was in closer communication with civil engineers. When the new proposals which were under consideration by the University were sanctioned he thought that the Sibpur College would be in a position to give a very excellent course of training.

RAI BAHADUR KRISHNA CHANDRA BANERJEE, Superintending Engineer, Public Works Department (*retired*).

Written Statement.

1,911. (*General.*) I entered the Indian Public Works Department in 1876, and retired from government service in 1909, as Superintending Engineer, 1st class. For nearly 30 years I was in the Bengal Public Works Department, the greater portion of which was passed in the Buildings and Roads Branch of the same. Since my retirement, I have been practising in Calcutta as consulting engineer, during which the construction of several large buildings was carried out under my supervision, such as the Durbhanga Library building, the Hardinge Hostel, etc.

1,912. (I.) *Economy and suitability of methods of execution of public works, and (II.) Encouragement of other agency.*—In my opinion, the methods at present adopted for the execution of civil works are economical and suitable for the purpose for which they are devised. Under the present system, all important materials are supplied by the Department, thus ensuring their good quality as a rule. Tenders are called for publicly, and the work is given out to successful tenderers, who are practically labour contractors.

(2.) The methods adopted by the big engineering firms in Calcutta are exactly the same. In these circumstances, it is not possible for these big firms to take up Public Works Department contracts unless the rates for the several items of work are considerably enhanced. It is thus manifest that the present system is not only economical, but ensures the execution of first-class work, as to which there is no question whatever. I will give here a few concrete instances. At present two big private buildings costing about Rs. 3,00,000 are being constructed by a firm under my supervision. In the accompanying statement,* I have taken a few items of work from one of the above estimates for the sake of comparison. It will be observed that the total cost of these works at Public Works Department rates would be Rs. 17,456, whereas at the rates tendered by the firm referred to above, the amount would be Rs. 23,417 or 34 per cent. higher. The rates for items of work for which details are not forthcoming, such as mouldings, etc., are certainly very high.

(3.) It is possible that the rates of other firms of builders in Calcutta may be somewhat less, if not more, but the

fact remains that it is not possible for any firms except ordinary contractors to take up contracts under the Public Works Department at the departmental rates as the rates would not bring in much profit to them. The margin of profit may be somewhat large, if the contracts be for materials as well as labour, but I do not consider this desirable, having regard to my remarks in the sequel. The systems followed by the Calcutta Port Commissioners and the Calcutta Corporation are similar in every respect to what are in vogue under the Public Works Department. These public bodies would not have adopted this system without due deliberation and consideration from every point of view.

(4.) I cannot say that under the present system private enterprise is not sufficiently encouraged. The materials supplied by the Public Works Department are the best and cheapest to be had in the market. This saves the contractors working under that Department and the supervising staff of the Public Works Department much time and labour which would otherwise have to be spent in their collection and supply, and which they now profitably employ in other ways. There is, however, room for improvement in the acceptance of tenders. They are, at present, accepted without any regard to the fact as to whether the tenderer is properly qualified to look after the works or whether the tenderer has properly qualified men in his staff or not. Ordinary *mistris* who have sufficient labour at their command, who are satisfied with a small margin of profit, or who are somehow in the good graces of the officer in charge, are generally the successful tenderers. Unless the Department makes it a rule that only such contractors who are sufficiently qualified, or who have sufficiently qualified men under them, should be given contract works, men who pass out from the Indian colleges, cannot have much scope to employ their energies on. I do not apprehend any enhancement of rates for this reason, as competition, which is very brisk, would bring down the rates sufficiently low to prevent the Public Works Department schedule rates from being exceeded.

1,913. (III.) *Changes in organization.*—From my long experience I think I am in a position to say that even with these high rates the work done by the big Calcutta firms requires a thorough supervision, by reason of the fact that it is sub-let to ordinary *mistris*, who are not as a rule over-particular as to how it is done

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[Continued.]

unless they are closely looked after. Thus it is not possible to reduce the staff of the Public Works Department except at the sacrifice of efficiency, unless the Department gives contracts, as suggested above, to qualified men who should have licenses granted to them, or to contractors who have such men in their service, so that in case of bad work they could be held responsible. Then only the staff may be reduced to a certain extent.

(2). It may not be out of place to mention here that the Public Works Department establishment is also required for purposes of administration to look after the numerous buildings under the Department, and to arrange for the carrying out of small additions and alterations, and petty repairs to these buildings, for which sectional contractors are generally employed, as it would not be worth the while of large contractors to undertake these petty works. But if these sectional contractors be qualified men under a license as suggested above, it is possible to reduce the subordinate staff considerably.

1,914. (IV.) *Relations with other departments and sub-branches.*—I would answer this in the affirmative, except that I consider that the Government Architect should have a larger staff to see that architectural work in a building is properly constructed. At present this work is left to be carried out by the ordinary staff of the Department, who have had no training in architectural work and are thus liable to make mistakes in the execution of the work. The services of the Architectural Department should be more largely utilized in this respect to ensure good and satisfactory work.

1,915. (V.) *Decentralization.*—I do not think further decentralization is desirable.

1,916. (VI.) *Simplification of procedure.*—The rules of the Public Works Department Code should in my opinion be relaxed in regard to the local purchase of stores as long as the schedule rates of the Department are not exceeded.

RAI BAHADUR KRISHNA CHANDRA BANERJEE called and examined.

1,919. (*President*). The witness stated that he was a retired Superintending Engineer of the Public Works Department. Since his retirement he had been working in Calcutta as a consulting engineer, and several private buildings had been constructed under his supervision.

1,920. The present methods of the Public Works Department for the execution of civil works were suitable. In the construction of buildings it was necessary for the Department to retain the supply of materials in its own hands to ensure their quality. He had found that good bricks were not always available in Calcutta, and unless special arrangements were made for their manufacture, supply could not be guaranteed. Generally, the quality obtainable in the open market was inferior to that of government bricks, and the quantity was insufficient for the number of buildings under construction in Calcutta. The government brick, in his opinion, was superior to the first-class brick made at private brickfields. Even if the class of brick required for the construction of a building were entered in the Public Works Department specifications of contract, he thought it would be necessary to engage a supervising staff for passing the bricks, and this would lead to an increase in their present cost. He had had experience of bricks manufactured at government and private-owned brickfields, and had found that in the case of first-class bricks the rates for the former were lower than those for the latter. He had had actual experience of building work in Calcutta as he had been the Executive Engineer of the 2nd Calcutta Division for six years, 1892 to 1898, and had subsequently held the post of Superintending Engineer of the Presidency Circle in 1907. Even so far back as the year 1907 the quality of bricks turned out by the government brickfield was superior to that of those manufactured by private agency. He could not remember whether he had ever made a comparison of the rates for bricks manufactured by

1,917. (VII.) *Education.*—I am inclined to think that there is room for improvement in regard to the practical training of students. Their training in estimating and designing is not quite up to the mark. Courses of lectures by eminently practical men or men of large experience in the profession, in agriculture, sanitary, electrical and civil engineering, should be arranged for. Tours of inspection of important and interesting works in progress should be extended over a longer period, and students should be explained the methods of construction of such works, and allowed to take copious notes thereof. As far as I know, the students of the Sibpur Engineering College have very few opportunities of availing themselves of this useful method of education, and in this respect the practice followed in the Roorkee Engineering College should in my opinion be adopted.

(2). I do not think the very best and most suitable men are at present attracted to the college, for the simple reason that they have far better prospects in the legal profession. If students be apprenticed under the big engineering firms, after their college training is over, and those who prove suitable are employed by these firms, which they are likely to do with pleasure in case they find them to be efficient, better classes of students would be naturally attracted to the college. This explains why Roorkee men are as a rule more successful than students of other Indian engineering colleges, simply because, owing to seven guaranteed appointments in that college students who go to prosecute their studies there are generally of a better class.

1,918. (VIII.) *Practical training.*—There is at present a provision for the practical training on works of students, but it is not uniformly satisfactory in the case of all students. Those sent to the railways generally get a far better training than others whose lot is cast elsewhere. This I say from personal experience. A far better plan would, in my opinion, be to apprentice them under some big firms, or place them under officers who have charge of important or interesting works, so that they may have ampler opportunities of learning their work, and are made much more efficient than at present.

government and private parties. The market rate for bricks at present was about Rs. 16 per thousand delivered at the site of the work and, as far as he could remember, the government rate was Rs. 12 per thousand. He had lost all touch with the Department since 1909.

1,921. The present methods of the Public Works Department for the construction of buildings were economical. He was satisfied that the items entered in the statement* appended to his written evidence could bear scrutiny and remarked that he had adopted as the present rates of the Public Works Department the figures supplied to him by the Superintending Engineer. From a comparison of the two sets of rates he had arrived at the conclusion that private rates were approximately 34 per cent. higher than those of the Public Works Department.

1,922. The experiment had been tried in Bengal some years ago of handing over to district boards for maintenance, in addition to their own works, certain government buildings and roads. At that time, he held the post of Executive Engineer, 1st grade, and was the Inspector of local works under the Local Self-Government Act; he had from time to time also held charge of several circles, viz., the Western circle, the Burdwan circle, the Eastern Bengal and Assam circles, and the Bhalgalpur circle. The system then adopted by the district boards was similar to that in vogue in the Public Works Department, and the boards used to give out work as the result of a call for tenders. The standard of the work done by the boards at that time depended a great deal on the officer in charge—the district engineer. In cases where the services of government officers had been lent to the boards, the work executed had been good; in other cases, the district engineers had not suffi-

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[Continued.]

cient experience of public works and the work was hence not quite up to the required standard. The system was eventually abandoned as work, on the whole, had not been very satisfactory, the main reason for failure being the employment of an inexperienced staff of officers and subordinates. He was, however, of opinion that, with experienced district engineers, the system would work satisfactorily.

1,923. At the present time there was duplication of establishment in Bengal. The Public Works Department staff engaged in a particular district had to look after certain buildings and roads, while the district board staff was also employed on similar duties in the same district, but he did not think it would be feasible to abolish the Public Works Department staff in Bengal and make over all works to the district boards. From his experience of contractors in the *mofussil* he considered them satisfactory and that no difficulty need be apprehended in this respect, but the execution of the work really depended more on the ability of the district engineer.

1,924. As an Inspector of Works, he had submitted his inspection notes both to the Chief Engineer and to the chairman of the district board, for necessary action. He had not been empowered to take any action himself. Even if he found that a building or road had been badly constructed, he had no powers in the matter; he was merely an inspecting officer. If he had found that work was still being carried out unsatisfactorily, after he had brought its defects to light in his inspection notes, all he did was to go on making remarks in that connection and nothing more.

1,925. He would not recommend that all government buildings and roads in the *mofussil* should be made over to district boards, because in many cases the district engineers had experience only in roads and bridges. Very few building works were carried out by the district boards, and their engineers would have to be trained in building construction during which training building works would go wrong. Government had the power to dismiss an unsatisfactory district engineer, but they generally did not resort to such an extreme measure.

1,926. (*Mr. Cobb.*) If for the construction of a building he required 1,00,000 bricks, and had the option of buying either government or private bricks, the rate for the former being Rs. 16-8 and that for the latter being Rs. 16 per thousand, he would choose the former, because government bricks were superior and better sorted. In the case of one of the buildings mentioned in his written memorandum he had found that the bricks used for its construction were not well pugged, and that their quality also was not very good. The best bricks obtainable in the open market were as good as government bricks, but were less well sorted.

1,927. (*Rai Bahadur Ganga Ram.*) Even at the time when he was an Inspector of local fund works the whole of the provincial works had not been made over to the district boards, as there was a Superintending Engineer of provincial works in the same district. He himself however was only in charge of district board works. In those days, sanction to the construction of government works was accorded by government, but the estimates for the construction of district board works were dealt with by the district boards themselves. Superintending Engineers did not possess the powers they now had; these powers, however, were seldom exercised. All district engineers were appointed by district boards. He thought it would be an improvement if a system were introduced under which district engineers were appointed by government and were all brought on to one cadre.

1,928. District boards accepted tenders by a majority of votes, and this led in practice to canvassing. He admitted that a good deal of canvassing for contracts did take place.

1,929. Under the Act he had been *ex-officio* member of every district board to which he had been appointed.

1,930. He would not have preferred, even if he had had the option, to retire earlier under a provident fund system.

1,931. (*Mr. Mackenzie.*) In the first item in the comparative statement* appended to his written evidence, "earth work in excavation of foundations," the rate of Rs. 25 per thousand charged by government showed that the foundations were rather unusual; if it had been simple work, the rate would have been about Rs. 10 per thousand. The remaining Rs. 15 per thousand was probably due to the discovery of a larger quantity of water in the foundations than had been expected, necessitating extra pumping. There was a large difference between the government rate of Rs. 25 per thousand and that of Rs. 42 per thousand which latter was actually charged by the contractor.

1,932. The difference in the rate for brickwork was not very great. The increase of 34 per cent. over the total cost of Rs. 17,456 mentioned in his comparative statement* was chiefly for wood-work, which was taken at the rate actually charged by the contractor. Timber was bought in the open market by both government and the contractor, and the carpenters' work alone was not so great as to justify such an enormous difference. He remarked, however, that brickwork measurements adopted by contractors did not allow for arch openings and that this made a great difference.

1,933. (*Rai Bahadur Ganga Ram.*) Brickwork rates included one inch of plaster which had to be added to the thickness of the walls and no arch openings were deducted; the latter item would make an enormous difference in the case of buildings which had many arch openings.

1,934. (*Mr. Mackenzie.*) In the last item in his comparative statement,* "4" terrace roofing," the government rate was Rs. 40 per cent. whereas the contractor's rate was Rs. 48 per cent. He admitted that the difference appeared to be great, but the contract rates included the cost of establishment and profits, in addition to the supervision of the contractor himself. He had received a percentage rate for supervising the construction of a private building.

1,935. In connection with the total increased rate of 34 per cent. over the government rates it was pointed out to him that government establishment charges would have been 21½ plus about 5 per cent., for works establishment, but he doubted whether that supervision could in any case have been dispensed with.

1,936. The present rates for steel-work were abnormal, but not for brickwork. He did not think the contractor in question had taken advantage of the market and charged very high rates. He had found that if materials for the construction of a building were supplied by the contractor the latter was usually inclined to economise; that was the main reason why he thought that the materials for buildings should be supplied by the man who took up the work.

1,937. A certain European firm in Calcutta did employ engineering talent, but they sub-let work to ordinary *mistris* who were not over particular as to the quality of their work. Supervision in such cases was essentially necessary, otherwise work would not be done properly. As a rule, however, contractors did not employ their own engineers.

1,938. He thought, on general grounds, that contractors should be licensed, and he would make it a condition that no contractor should be employed by government unless he employed an engineer to advise him. He thought it would be a very good thing if a proviso were made in all contracts to the effect that they should not be sub-let.

1,939. He knew the rules in connection with the purchase of European stores very well, and thought that when there was not sufficient time to obtain stores direct from England for the construction of buildings they should be purchased locally. A good many government officers preferred buying their stores from England as materials so bought were of better quality and cheaper.

1,940. (*Sir Noel Kershaw.*) The Public Works Department rates quoted in the statement* appended to his written evidence had recently been furnished to him by

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[Continued.]

a Superintending Engineer and were taken from the present Public Works Department schedule of rates which was periodically revised. The rates, which included labour, could not be influenced by the war as only steel-work had been so affected. He could not say whether the rates for labour were the same as those of last year or the year before, as he had lost touch with the Department. The rates in the schedule could not be exceeded without government calling upon the officer in charge for an explanation. If a contractor tendered above the scheduled rates efforts were made to induce him to reduce his tender; if he would not do

so, however, special sanction would have to be obtained. It sometimes did happen, but not frequently, that a contractor refused to reduce his rates.

1,941. He thought that architecture and reinforced concrete should be added to the curriculum of the Sibpur College, because such work was frequently done nowadays by men who had had very little training in those subjects.

1,942. (*Rai Bahadur Ganga Ram.*) The witness did not admit that the rates entered in the statement * prepared by him were in many cases unreliable.

At Calcutta, Friday, 9th February 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.
C. S. COBB, Esq., M.V.O.

RAI BAHADUR GANGA RAM, C.I.E., M.V.O.
A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

The HON'BLE MR. H. H. GREEN, Chief Engineer and Secretary to the Government of Bengal, Buildings and Roads Branch.

D. G. HARRIS, Esq. (*Secretary*).

OSWALD MARTIN, Esq., Partner, MESSRS. MARTIN & Co., Engineers and Contractors, Calcutta.

Written Statement.

1,943. (I.) **Economy and suitability of methods of execution of public works.**—The methods adopted for the execution of civil works are eminently suitable for the purpose for which they were devised, but, in our opinion, that purpose has been served, in so far as building works are concerned, in large centres where master-contractors are established and thoroughly competent to carry out such works to the standard required by the Public Works Department. Having no access to the figures of expenditure, we are not in a position to state whether the methods employed by the Public Works Department are economical, but we suggest that a considerable economy might be effected in establishment charges, both in England and India, by the employment of master-contractors in the large centres above referred to.

1,944. (II.) **Encouragement of other agency.**—Under the existing system and rules, private enterprise, speaking generally, is not encouraged, labour contractors only being employed and tenders not being asked for the execution of complete units of work. In our opinion it is possible and desirable to entrust the construction and upkeep of certain classes of public works, such as large public buildings, to established master-contractors who would undertake both the construction and upkeep of such buildings. The changes in the present procedure that we would suggest are :

(a) that in certain centres such as Calcutta, Bombay, Madras and other large towns tenders should be invited from master-contractors for all public buildings, and that the same procedure should be adopted in any other place where large public buildings are to be erected;

(b) that such buildings should be constructed under the supervision of a Public Works officer, who would approve of the quality of all work and certify to the quantities to be paid for.

1,945. (III.) **Changes in organization.**—Any changes in the nature of those above mentioned, recommended by the Committee, would necessitate a considerable reduction in the establishment of the Public Works Department, more particularly in the subordinate staff in the centres where the changes in procedure are recommended. Any further reduction would be effected gradually and as the changes in procedure were extended to other districts and

centres. The reduction of the home purchasing and inspecting staff would also be necessary.

1,946. (VII.) **Education.**—The system of education in government engineering colleges is, we understand, already receiving the attention of government. We employ a considerable number of civil engineers whose professional education was acquired at government engineering colleges and we may state that, on the whole, we have found them quite competent in relation to the diplomas they held.

1,947. (VIII.) **Practical training.**—In our own case such students receive their practical training on our own works.

1,948. (*General.*) Speaking generally, we think the time has come when some changes should be made as regards the carrying out of public works. When the Public Works Department was first established, there was no existing agency for the carrying out of large works, and there was no standard as to the class of work to be done. The picked body of engineers, composing the Public Works Department, have always set and maintained a high standard of quality, and at a not excessive cost, and at the time when public buildings were being erected in every part of India such a department was necessary. The "dead charges" are, however, necessarily heavy and at times when few large works are being done represent a more or less unproductive charge.

(2). In the large towns, above referred to, there are a number of master-contractors who have come into existence for the purpose of carrying out works other than those purely government, that is, for private parties, municipal, port trust, etc., and there are a sufficient number to ensure keen competition. These being already in existence and increasing in number, it appears to us, that it would be an economy to construct public buildings by such an agency. At present there are, in the same town, the Public Works Department to construct government buildings as and when required, and contractors to construct all other buildings, and there seems to be no reasonable doubt that one or the other agency could do both works. In fact, should government decide to modify the present procedure of the Public Works Department as indicated above, we see no inherent objection to the supervising Public Works officers being permitted to do the

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MR. OSWALD MARTIN.

[Continued.]

same work for buildings outside those purely government.

(3). We think it is generally recognised that competition promotes economy and lower costs all round. The history of every trade and industry confirms this, and the more work that can be given out to contract, the more competition there will be. We also believe that a saving of time will be effected in construction of buildings avoiding loss of interest and increase of "dead charges."

MR. OSWALD MARTIN called and examined.

1,949. (*President*.) The witness stated that he was a partner in the firm of Messrs. Martin and Company, and that he was a qualified civil engineer. His firm undertook every description of contract work in connection with the construction of large buildings, and, as regards sanitary engineering work, contracted for water-works and drainage schemes.

1,950. The firm employed its own engineers and in normal times had two architects, who were Fellows of the Royal Institute of British Architects. There were, he surmised, about half a dozen good firms in Calcutta who employed their own engineers.

1,951. It was not the present practice for the Public Works Department to invite tenders for complete units of work, and when calling for tenders it was stipulated that the supply of materials such as bricks, *sarkhi*, etc., to contractors would rest with the Department and that their value would be deducted from bills for work done. Generally, tenders were invited for separate portions of work, such as for stone-work, wood-work, etc., but he thought that the Department sometimes invited tenders for an entire project, on condition that the materials would be supplied by the Department.

1,952. It was certainly not necessary for the Public Works Department to supply materials in Calcutta. He did not agree with the contention that one of the reasons why government maintained its own brickfield, and made its own bricks, was that it was compelled to maintain a reserve stock of bricks owing to the liability of the stock in private hands in Calcutta running short, and remarked that government could quite easily call for tenders for the supply of bricks which it needed. The private supply of bricks in the open market in Calcutta was normally adequate for requirements. There were quite a number of brickfields in the neighbourhood of Calcutta, and the firms who owned them stocked bricks to meet the demand. If the demand increased, there would be a corresponding increase in the number of brickfields, as in the case of other marketable commodities. It was, of course, a matter of opinion whether it could be argued that the bricks in the open market were not sufficiently good for government buildings, but, personally, he considered that the bricks made by the best manufacturers were quite as good as those made by the Public Works Department. He thought sufficiently good bricks might be purchased in the open market, and that there was no need to anticipate difficulty from the fact that bricks in the open market were not uniform in quality, and consisted of first-class bricks intermixed with those of the second-class thus necessitating their sorting. If the quality of brick required was specified in the contract, there was no good reason why that specification should not be followed in regard to bricks, as in the case of other materials purchased in the market. Though it had been maintained for a long time that the cost of government bricks was usually below that of bricks in the open market, the point was a moot one. In his opinion, the Public Works Department rate for bricks was a purely fictitious figure. To begin with, the Public Works Department did not manufacture their own bricks, but leased the brickfields out on contract, and the bricks were brought to the site of work and charged to the contractor at the Public Works Department rate, in which no allowance whatever was made for general charges such as interest on capital, outlay on the brickfield, etc., nor was any account maintained of the cost of land, plant and supervisory establishment. His remarks were, however, based on hearsay and he was open to correction. If the items he had alluded to were

(4). We may here mention that the methods of construction and building adopted by master-contractors are such as ensures the lowest cost, inasmuch as it is customary, and keenness of competition ensures this, for master-contractors to obtain all their materials at first hand, manufacturing all their own bricks, etc., and do not sub-let any portion of the work.

taken into consideration, he believed the bricks in the open market would be found to be considerably cheaper than the Public Works Department bricks.

1,953. In regard to lime, the Public Works Department insisted on contractors using a particular quality, which they themselves supplied. He considered that as specifications for buildings generally stated the make of lime to be used, such as Sutna lime, or stated that the lime was to be of an approved quality to be decided by the engineer in charge of the works, there was no reason at all why the Department should purchase the lime. The Department might simply specify to the contractor the kind of lime required, and allow him to make his own arrangements.

1,954. He explained his contention that the utilization of large contracting firms would economise establishment in the Public Works Department by remarking that in Calcutta for instance there was, at present, a very large establishment maintained by the Department. There were three divisions with three Executive Engineers and several Assistant Engineers, and upper and lower subordinates. If his suggestion were accepted, economy might be effected in the upper and lower subordinate establishment, and instead of three circles of superintendence probably one might be sufficient under an Executive Engineer, who would simply be a sort of government Inspector of Works. It would be necessary to have a superior officer visiting works from time to time, but it would not be necessary to entertain any works establishment for duty on each work, though it might be advisable to employ a clerk of works in connection with each work. At present the Public Works Department exercised considerably greater supervision, and were practically contractors themselves, who sub-let portions of work to sub-contractors. If his plan were adopted it would not result in large contractors leasing out work in a similar manner to small contractors, as large contracting firms in Calcutta did not sub-let work. They dealt with labour contractors, *i.e.*, they arranged with a group of masons that they should carry out work on the piece-work system, and they paid these masons at a certain rate for units of work, instead of by daily wage. It depended on circumstances whether a large contractor would sub-let stone-work to a stone mason. In the case of Porebunder stone, which was cut and wrought by Porebunder masons, the practice was frequently to sub-let but in the case of ordinary chunar stone, stone-work was done by the contractors themselves.

1,955. He had not effected a comparison between the government and private rates for buildings, as his firm had no access to the government figures, but he believed that some years ago a comparison was made by the Chief Engineer, Bengal, though he was not aware of the result. He added that figures for such a comparison would have to be gone into very carefully, as it was a difficult matter to compare rates of buildings erected by two separate agencies. Further, as the Public Works Department cost of bricks was, in his opinion, fictitious, no comparison could be made without seeing the Public Works Department figures in detail.

1,956. He explained that the term "dead charges," as used in his written statement was taken to cover all charges for establishment, for example, the Public Works Department establishment in Calcutta consisted of a Superintending Engineer in charge of three divisions with Executive and Assistant Engineers and a staff of upper and lower subordinates under him. Unless working at full pressure, a great portion of this establishment was not always absolutely necessary. The term "dead

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[Continued.]

charges" also covered all charges for rent, office expenses, tools and plant, etc. He added that in comparing the cost of buildings constructed by government and private agency these items ought to be taken into consideration as they formed a big item in the expenditure of the Public Works Department.

1,957. Though his firm was willing to design water-works and drainage schemes of which they undertook the construction, all these works were as a matter of fact designed by the Sanitary Engineer of the province concerned, as they were nearly always government or municipal works, and none of them were private works. His firm did, however, once prepare a design for such a work, but it was unusual, though his firm was quite prepared to do so in every case. He recommended that government might retain the actual designing of such schemes in their hands, but should throw open their construction to large contractors who were prepared to tender for entire works. His firm had constructed several water and drainage works, and in fact the majority of the Upper India works at Allahabad, Lucknow, Cawnpore, etc., had been constructed by his firm. In these particular cases, tenders were given for the whole work.

1,958. (*Sir Noel Kershaw.*) It would be sufficient, for the execution by private agency of large works, to employ only a clerk of works whose work would be inspected periodically by an Executive Engineer or sub-divisional officer. The Public Works Department when constructing a large building virtually took the place of a master-contractor and engaged more staff than he thought necessary. When a large work was constructed by his firm an Assistant Engineer instead of a clerk of works, with three or four upper and lower subordinates were usually employed. The proportion of upper to lower subordinates varied with the size of the work and the establishment available. If a work costing Rs. 6,00,000 were constructed by a private firm, it would lead to a considerable saving in establishment. At present, in addition to an Assistant Engineer, the Public Works Department probably employed three or four subordinates on a work of that size whereas his firm would only engage one subordinate. As a concrete instance he cited the case of the construction of the High Court at Allahabad. That work had been supervised by a senior Executive Engineer, two Assistant Engineers and probably half a dozen subordinates. As far as he was aware the work was the only one in charge of that particular Executive Engineer. His firm were building a similar High Court at Patna and it was only necessary for the Public Works Department to employ one Assistant Engineer and one subordinate.

1,959. When a contractor undertook the construction of a private building in Calcutta he generally only employed one clerk of works for its supervision even if it was estimated to cost Rs. 6,00,000. The clerk of works might be an engineer or a man with architectural qualifications. He would probably be a whole-time man on a salary of Rs. 200 or Rs. 300, and was not always appointed in addition to the architect who designed the building, as generally contractors designed the buildings they constructed. If the contractors themselves had not designed the buildings, and an architect had been employed, it was probable that such an architect would also inspect the buildings whilst they were under construction. For construction by piece-work more supervision was required as there was a tendency on the part of the petty-contractors to do as much as possible within a limited time.

1,960. The distance within which a large contractor in Calcutta would be willing to operate would depend on the size of a work but he did not think that a master-contractor would think it worth while to take up work outside a radius of three hundred miles if it amounted to less than Rs. 5,00,000. His firm had recently taken up a work so situated and its estimated cost was Rs. 5,00,000.

1,961. There was no inherent objection, if the present system were modified, to the Public Works Department officers undertaking the supervision of work other than purely government work, in the same way as architects were allowed to take up private practice. He did not think such permission would operate against private en-

terprise or lead to competition, as it was only intended that such officers should have supervisory duties.

1,962. (*Mr. Mackenzie.*) On the presumption that the changes he had recommended were introduced, the reduction in establishment in India and in the purchasing and inspecting staff in England, which was referred to in his written statement, would be brought about by the purchase direct by contractors of the European stores which were at present obtained by the Department through the India Office. It was true that the rules permitted the local purchase of stores, and that those rules covered nearly everything that was required in India, but the rules were very seldom followed as it was very much easier for an Executive Engineer to indent for what he needed, inasmuch as he was required to furnish reasons for each local purchase he effected and shoulder the responsibility for the suitability of the materials. It was not his opinion that the Public Works Department considered that the materials in India were not good enough, as steel joists of well known brands, for instance, could be obtained from firms in Calcutta and Bombay, identical to those purchased by the India Office in England. It was certainly the general impression that stores locally purchased were more expensive than those obtained by indent on the India Office, but he did not think that this was really the case, though he could not prove it. His reason for thinking so was that purchases in India were made direct and not through an intermediary.

1,963. He approved of the suggestion that a buyer should be appointed either for the whole of India, or separately for each province, if such a scheme were found practicable. Personally, he had not considered the point, but mentioned that it had been discussed at great length by the Indian Engineering Association in whose hands he desired to leave the matter. This body had held numerous meetings and discussed the matter with the Member for the Commerce and Industry Department. In his opinion such buyer should be a whole-time government official, and it would perhaps be necessary to appoint more than one for the whole of India, though certain provinces might be linked up such as Bengal and Bihar and Orissa for instance. Probably it would be best to have a buyer at each of the important centres, *viz.*, Bombay, Calcutta and Madras. It would not, however, be possible to abolish the India Office entirely, as certain indents would still have to be sent forward to England for compliance.

1,964. (*Rai Bahadur Ganga Ram.*) The building which his firm were constructing in Dalhousie Square was estimated to cost a little over Rs. 3,00,000, and that in Lal Bazaar about Rs. 6,00,000. As his firm possessed four brickfields of its own it had no need to purchase bricks in the open market for these buildings.

1,965. Messrs. Martin and Company issued bricks at Rs. 11-8 per thousand and the rate included interest on capital, rent and, in fact, all other charges. The rate was the same as that of the Public Works Department, but the latter rate did not include all charges.

1,966. His firm was prepared to undertake the designing of water-works at a charge of 5 per cent. for small projects. The firm had undertaken a few small works at hill stations and in those cases they supplied their own pipes and sometimes also their engines. The pipes were passed in India by the Sanitary Engineer, and each pipe was tested at the manufactory before the issue of a test certificate.

1,967. The clerk of works watched progress on behalf of a firm's client, his qualifications varied and depended entirely on the magnitude of the work.

1,968. (*Mr. Cobb.*) The issue to contractors of departmental materials did prevent master-contractors from tendering for works, as their supply by government precluded the making of any profit on materials, and the only persons who were able to tender for Public Works Department works were labour contractors, who could undertake work for a small profit. If contractors were allowed to obtain bricks in the open market it would certainly be necessary to exercise close supervision on the quality of bricks used on a work. It was rather difficult to say whether such supervision would cost government more than the reduction of the cost of their own bricks to

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MR. OSWALD MARTIN.

[Continued.]

market rates, but he thought that the contractor's reputation was a sufficient guarantee for the supply of good materials, and that he could not afford to supply bad bricks, and thus lose both his reputation and the possibility of securing additional work. The accord of permission to contractors to purchase their own bricks would lead to an improved class of bricks as the contractors would naturally be anxious to please the Public Works Department and see personally to the suitability of the bricks. Hence government could be sure of a fair return for their money, and provided there was sufficient competition in each case, an improvement in the class of bricks. If he were a small contractor, without a brickfield, he would not necessarily buy the Public Works Department bricks in preference to private bricks, but his decision in the matter would depend on the class of bricks offered by the Public Works Department.

1,969. It was, he thought, very desirable to have the Public Works Department buildings designed by private architects by throwing out such buildings to open competition, but he could not say whether the time was ripe for such an innovation. There were not a sufficient number of architects available at present, but he anticipated that they would be in the near future. The system of competition would be advantageous as it would give the best men a chance, whereas in the Public Works Department, as at present constituted, a man received promotion in due course, whether he merited it or not.

1,970. Asked whether a plastered or a wholly brick building was more expensive to maintain, he replied that the latter would be cheaper in the end, though at the commencement such a building would be more expensive to erect. Plaster he added cost about the same as the pointing of bricks.

1,971. (*Rai Bahadur Ganga Ram*.) He did not think that a building in Calcutta which was covered with plaster was cooler, but was inclined to think that this was the case in up-country stations like Allahabad where stone lime or *ghooting* mixed with sand was used.

1,972. His firm would not be prepared to undertake a work the estimate for which was based on the Public Works Department schedule of rates and which placed bricks at Rs. 11-8 per thousand (the cost price of bricks manufactured by his firm), as that figure did not include the firm's profit. Ordinarily speaking, as the firm maintained brickfields for its own works, it could not undertake a government work unless a profit of 10 per cent. was allowed for. The Public Works Department schedule of rates did not allow for contractors' profits on bricks but only allowed a profit of 10 per cent. on the labour portion of the work and his firm, as he had stated, would require a profit of 10 per cent. on materials also which were at present supplied by the Public Works Department.

1,973. (*Mr. Green*.) His personal opinion was that government were not really able to purchase articles cheaper than through the agency of master-contractors, but the question was a difficult one to prove either way. A firm could buy materials more cheaply than government because it was able to purchase at times when it suited manufacturers to sell, whereas government approached suppliers and middlemen just when they required any particular material and hence had to pay more.

Besides, a private firm stocked a particular article for use and bought it at a cheaper price than government because its purchases were made at wholesale and cheaper rates. His firm, for example, had a London branch which purchased just what manufacturers were disposed to sell and shipped the material to Indian branches to stock. In the case of steel joists, the firm obtained from the manufacturers so many hundred joists at a time of stock length, and these were utilized in the buildings undertaken by the firm after being cut to size in the firm's own yards. As a concrete instance, he cited the case of the Patna and Allahabad High Courts the plans of which were similar. In the case of the former, the rate for fixing the joists supplied by his firm was Rs. 8-8 a hundredweight, whereas the Public Works Department estimated rate for the Allahabad High Court was Rs. 11 for large sections and Rs. 10 for small sections, and after allowing for the difference of freight and for duty paid the rates were, Martins, Rs. 8-12, Public Works Department, Rs. 11 and Rs. 10. The joists for the Allahabad High Court were obtained direct from the Director General of Stores, but by utilising his firm for the Patna High Court the Department saved very considerably. Mirzapur and Porebunder stone could also be obtained at cheaper rates than the Public Works Department as the firms employed an agent who went round the quarries, made bargains on their behalf, and despatched the stone. It was true that such agent gave advances, but that was the ordinary way of doing business. He was aware that the Public Works Department could not do so, as they were prohibited by rule from granting advances. If a special kind of lime such as Katni was specified he admitted that his firm would probably not be able to obtain it cheaper than the Public Works Department did, but considered that the difference between the two rates would be small.

1,974. If the government Akra brickfield was worked more economically, and as a business concern, it would probably make a difference of at least one rupee in the rate of government bricks. Private firms would be able to supply as many as fifteen lakhs of bricks at a time, if they were given a season's notice of the number of bricks that were required. His firm manufactured bricks as economically as possible, and did not add on interest to the capital charge of the bricks they stocked. The brickfields were cleared every year, and if by chance the bricks were not used by the firm they were sold.

1,975. (*Rai Bahadur Ganga Ram*.) He admitted that if the Public Works Department brickfields were abolished it might possibly lead to the formation of a ring of contractors and to an increase in the rates, but such a contingency was possible anywhere and in every case. The rise and fall of the market rate was governed by the excessiveness or otherwise, of the demand.

1,976. The firm undertook the construction of the Agricultural Research College at Sabour at an estimated cost of Rs. 5,00,000. An Assistant Engineer was placed in charge of this work, with about three or four subordinates, and the resident engineer visited the work from Calcutta. His firm welcomed supervision, and the more there was from their clients the better pleased the firm were.

J. C. BANERJEE, Esq., Engineer, Builder and Contractor, Calcutta.

Written Statement.

1,977. (1.) **Economy and suitability of methods of execution of public works.**—(a). At present building works are generally distributed piece-meal, for instance, masonry works are given to one, wood-work to another, steel-works to a third, and so on. I beg to suggest that if a tender for the work as a whole is called for and the work is given to a single contractor out of the tenderers, economy can be effected, for the contractor while tendering for the job will calculate his rates at a lesser margin of profit for each item so that when he gets the whole work his profit on the aggregate would be modest. This kind of distribution of work would not only be an incentive to

economy on the part of the government but would also help the contractor to train himself up in all particular kinds of work, big or small. If, however, work is distributed by piece-meal it not only retards the training of the contractor and the progress of the work but also tends to increase the cost of the work in the long run.

(b). The Public Works Department should give the contractors the option of buying materials locally or indenting for the same from foreign countries of approved quality instead of buying them at a high price and compelling the contractors to take and pay for them. At the same time it should be kept in view that good and expensive material and workmanship are absolutely necessary

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[Continued.]

for construction and durability of a building. To secure this end the supervision of the Public Works Department is necessary.

(c). In giving out works the officer who has the distribution should select according to the importance of works substantial contractors of tried ability and experience with some engineering qualification who may be able to suggest economy to the supervising officer. One effect of such selection would be the growth of private engineering firms aimed at by the Government of India.

(d). Good and honest work is the passport to promotion. If officers of unquestionable ability and possessing adequate engineering qualifications and experience are placed in charge of works economy is sure to result.

(e). The existing departmental specifications of work should be thoroughly revised and costs of works analysed by a body of competent engineers from the Public Works Department, Port Trust, Railways and representatives of engineering firms.

1,978. (II.) Encouragement of other agency.—The execution of works by contractors under the supervision of the Public Works Department is done efficiently. Such amount of efficiency can hardly be expected of any other agency unless they have an equally experienced and organized staff as maintained by the Public Works Department. In my opinion, the present organization maintained by the Public Works Department is model and ideal. Any young engineers working under them as contractor, overseer or engineer in the beginning of their career gather great knowledge and experience, and I am sure this training helps vastly towards the development of their future career. Many instances can be cited about men who worked in their early days in the Public Works Department and that have succeeded well in their profession. In the event work is executed by other agency its aim will be to do the work cheap. If cheapness of works be allowed to have more appreciation than quality then the high standard of work which is maintained by the Public Works Department will be affected. The ideal of

the Public Works Department works is being followed by private individuals and even by commonest of labourers.

1,979. (III.) Changes in organization.—(a). The reduction of the staff will depend on the changes introduced by the Committee. It is too early in the day to suggest any reduction of staff.

(b). It may, however, be suggested in a general way that if contractors of the class suggested in paragraph 1977 are given the work, the *personnel* of the Public Works Department may consist of a Superintending Engineer with less office work and more inspection with two or more Executive Engineers and under these Assistant Engineers or clerks of works. The lower subordinate establishment may gradually be reduced, who will find employment with the contractors with better pay. The work of the lower subordinate establishment can be done, if it can be managed, by passed students of engineering colleges placed under training in the Department.

1,980. (VII.) Education.—Inadequate. The system of education adopted by the government engineering colleges is not sufficient to meet the requirements of the Public Works Department, local agencies and private engineering and contracting firms. They require men of more practical training with knowledge of special subjects in different engineering branches, such practical training can only be had at the government works, works of public bodies, railways and private engineering firms and manufacturing. The present system of practical training in the Bengal engineering college, especially in the civil branch, at the end of their theoretical course is not of much value for practical purposes. Further, there is at present no arrangement for learning thoroughly architectural, sanitary and railway engineering essentially necessary for engineers. The addition of these departments in the colleges would be of great advantage to the students as well as to their employer.

1,981. (VIII.) Practical training.—The existing provision is inadequate, so far as I am aware.

MR. J. C. BANERJEE called and examined.

1,982. (President.) The witness stated that he was a building contractor in Calcutta, that he had studied for three years in the Sibpur Engineering College, and that he employed several trained civil engineers from that college on his staff.

1,983. His main recommendation in the matter of the encouragement of private enterprise was that tenders should be called for for entire works, and not for the execution, by piece-work, of particular sections as was the present practice. He considered that the adoption of his suggestion would result in economy in that the establishment charges of a single contractor would probably be less than the aggregate cost of the establishments which would have to be entertained were several contractors employed. It was not the practice in Calcutta for large contractors to sub-let contracts, unless they pertained purely to the supply of labour.

1,984. He considered that contractors should be allowed the option of supplying materials instead of obtaining them from the Department as they often had to pay higher rates for them than those prevailing in the open market owing to the large departmental establishment that was entertained, but that it was necessary for government to maintain its own brickfield in Calcutta on account of the large number of government buildings which were always in progress. Three or four years ago there had been a scarcity of bricks resulting in inflation of the rates. There had also been a similar occurrence six years ago, owing to the simultaneous construction of a large number of private and government buildings. As a sequence, there had been a shortage of bricks towards the end of the year and the Public Works Department had had to fall back on the bricks obtainable in the open market and to pay rates higher by Rs. 2 or Rs. 3 per thousand. In his opinion, the ordinary market could supply government with bricks for any of its large projects provided timely arrangements were made, but difficulty would probably be experienced in obtaining a uniformly good quality or any

particular class that might be required. Akra bricks were generally very good, but occasionally the quality was inferior owing to the brickfield having been worked for a long period. It was necessary to use fresh earth in order to secure good bricks. The Bally bricks were very good. The question as to whether the quality of government bricks was inferior to that obtainable in the open market hinged on the particular class of bricks referred to. Bricks of inferior as well as of good quality were available in the open market. The price of the latter was excessive and in the previous year the difference in price as compared with the Akra article had fluctuated between Rs. 1-8 and Rs. 2-4 per thousand. The best first-class private bricks were somewhat superior to the Public Works Department bricks and dearer by Rs. 2-4-0 per thousand. For bricks of the identical quality there was a difference of a rupee between the Public Works Department and private rates, the former being the cheaper of the two. It was advantageous to private enterprise generally and to small contractors in particular to obtain bricks without actual cash payment, and viewed from a monetary stand-point, the Public Works Department work was rather more attractive than private work. He favoured the submission of tenders for an entire project, leaving it optional to a contractor to supply his own materials or to obtain them from the Department. This would necessitate the submission of alternative tenders, but he advocated it in the interests of economy.

1,985. He did not think that the acceptance of tenders for entire projects would lead to departmental savings on supervisory establishment, as such establishment would still be required for the check of measurements and the supervision, generally, of the work. Contractors in such cases would, however, have greater responsibility and work more efficiently.

1,986. He did not mean to suggest, in his written memorandum, that lower subordinates should be entirely abolished, but that their number might gradually be

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reduced. One method by which such reduction could be effected was to utilize the services of students from the engineering colleges and thus, while giving them a course of practical training, indirectly, get them to replace lower subordinates. The students while so employed would receive a good training in supervising work and at the same time set free lower subordinates for other work. In his opinion the lower subordinate establishments were not of much use in supervising the erection of buildings provided an Assistant Engineer paid frequent visits of inspection. He did not mean to imply that the abolition of lower subordinates would be profitable to contractors, but had made his suggestion more with the view to open out a field for the practical training of engineer students.

1,987. He advocated a revision, by a competent committee of engineers, of the specifications of the Department as they were too high in some cases. The margin of safety allowed by a large contracting firm was 3 per cent. while the Public Works Department took it at 4 per cent.

1,988. In his opinion the present course of practical training of students was not satisfactory. It was true that they received training in the workshops of the college but they were not accorded any training in building construction which to his way of thinking was essential. One and a half years' training in workshops after completion of the theoretical course was not of great value and he would, by preference, attach students after their theoretical course to large government and other works, and thus place a better practical training within their reach. It would also be an improvement if, instead of giving students a workshop training, they were attached to large building firms. He had had no experience of railways and could not say definitely whether the training they afforded would be suitable but he considered that as railway works were of great magnitude, students might with advantage be employed on supervising them.

1,989. His firm had undertaken the practical training of four or five students, and had started them as apprentices, eventually placing them in charge of works on their proving their competency. The students the firm had thus employed were either passed men or those who had received a few years' instruction in the college and failed to qualify. Such students did not meet the requirements of contracting firms when they left college, but they became useful after a year's practical training.

1,990. The theoretical course at the Sibpur College was satisfactory, but specialized subjects such as architecture and sanitary engineering might be introduced.

1,991. (*Mr. Cobb.*) With regard to his suggestion that contractors should be allowed the option of obtaining their materials either from government or from private sources he admitted that as government bricks were somewhat cheaper it would be to the advantage of contractors to buy them, but added that there were other materials which could be obtained more cheaply in the open market. Brickwork usually absorbed 50 per cent. of the building materials used hence a contractor supplied with government bricks would have to content himself, so far as materials were concerned, with profit on the remaining 50 per cent. Large contractors might not approve of the departmental supply of bricks, but other contractors would be satisfied. If he personally had the choice of accepting a contract with, or without, the supply of government bricks, he would take the former.

1,992. In his opinion workshop training in college was a waste of valuable time. If a student could be given an outside training on works, for a certain period, during his college course he would, in theory, derive benefit from the practical training thus afforded, but he doubted whether the sandwich system would work satisfactorily in actual practice.

1,993. (*Rai Bahadur Ganga Ram.*) He had no brickfield of his own, and always obtained his bricks from the Public Works Department for Public Works Department buildings and the best available bricks for private buildings. For a large building which he was then constructing in Dalhousie Square he had purchased bricks at Rs. 18 per thousand in the open market whereas government bricks would only have cost him Rs. 16 at the site of the work. The estimated cost of the building was Rs. 5,20,000, of which Rs. 68,000 represented the cost of brickwork only. His average rate for brickwork was Rs. 32. He used ten inch bricks and consumed about one thousand including wastage in every hundred cubic feet of brickwork. The bricks were not pressed, but manufactured in the ordinary manner. They were, however, well pugged and were dearer than government bricks.

1,994. He did not engage any *mistris* on the supervision of works, and this duty was assigned to men who had been trained at the Sibpur College. He employed *mistris* only for the lay out of works under the direction of the engineer in charge.

1,995. The hostel accommodation in Sibpur was fairly suitable.

1,996. (*Mr. Mackenzie.*) He expressed himself as unable to offer a definite opinion on the question whether government bricks would be dearer if all charges, including interest on sunk capital, were taken into consideration. He was, however, rather inclined to the view that the initial outlay must already have been recouped as the kilns had been in use for a very long period and their outturn was large. Government brickfields were necessary for state purposes, as building projects were sometimes sanctioned at periods of the year when no good bricks were available. Private firms could meet such a difficulty, but they would demand higher rates as it involved a larger capital. As regards the suggestion that government should only retain a limited reserve, and no more, and indent on the open market for any additional requirements, he stated that that course would not be feasible as bricks could not be stocked for any length of time.

1,997. (*Mr. Green.*) The bricks for which he quoted the rate of Rs. 18 were first-class bricks, and were all of the same class. They corresponded in quality to the Public Works Department bricks which were rated at Rs. 16 per thousand.

1,998. He had no idea as to what was the difference between the price of steel joists supplied by government, those obtained from private firms in Calcutta, and those imported from England, not being aware what government paid for such articles owing to the fact that joists were issued to contractors and that labour rates only were paid. On no occasion were joists made over to him at full rates and their value deducted from his bills.

1,999. The standard of work would probably deteriorate if private firms were allowed to execute work without departmental supervision, particularly in cases where low rates were quoted.

J. HARPER, Esq., General Manager, MESSRS. MARSHALL, SONS & CO., LTD., Calcutta.

Written Statement.

2,000. My experience in this country extends over a period of 27 years, during which time I have had business relations with the Public Works Department and other government departments.

2,001. (V.) Decentralization.—It has long been advocated that considerable economy might be effected by the various government departments having fuller powers to purchase their requirements locally. Some concessions

in this respect have been made, but in my opinion do not go far enough to ensure the real benefits that might result from a more complete organized system. The present *modus operandi* of sending indents through the India Office must frequently mean considerable delay, retarding important works, and sometimes resulting in engineers not having their exact requirements fulfilled. It is also believed that a substantial saving would result from the introduction of an efficient purchasing department on this side.

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(2). It must be borne in mind that facilities for obtaining locally a large portion of the required supplies are yearly becoming greater. As examples, I would point to the Tata Iron and Steel Works, and the excellent quality cement that is now being manufactured in the country, so that there would be the further advantage of government assisting in a marked degree many local industries, were some organization, as suggested, brought into being.

(3). As regards road rollers, portable engines, disintegrators, etc., which are in frequent demand by the Public Works Department these could invariably be procured on the spot, as most of the leading English makers have agents in the leading centres, who, in normal times, stock such machinery, and my own Company, who are contractors to all departments of the Government of India, lay themselves out to keep a varied assortment of such machinery at their branches at Calcutta, Bombay, Madras and Lahore.

(4). What is suggested would entail a separate purchasing department controlled by a responsible competent officer, but the system should enable the departments to procure their requirements more economically than by the present routine, and avoiding the drawbacks previously referred to.

(5). I regret time will only permit of my touching upon the finger of this important subject, but should any innovations, at any time, be contemplated, my humble services are at the disposal of the authorities. In this case, my offices might be considered of some use, as my experience goes back some years, and includes the arranging of contracts with the India Office and Indian State Railway departments in London, supervising the progress of contracts through our works in England, and the tests required by the specifications, in the presence of the inspecting engineers.

2,002. (VII.) Education, and (VIII.) Practical training.—It has long been my opinion that there should be an excellent scope in this country for the employment of the better class Indians in the engineering profession. I refer now more particularly to the mechanical branch, which should certainly offer many inducements and advantages to the educated and intelligent youth of India, if he were willing to submit to the necessary training. The over-crowded legal and medical professions, however, appear at present to be the most popular career, and, in consequence, it must be difficult for many to find sufficiently remunerative appointments adequately to compensate them for the cost and labour of their training. Engineering will continue to play a most important part in the world's progress, and in this country, with its gradual development and immense resources and possibilities, the engineering profession should in time offer lucrative careers for our youth, that is not now dreamt of.

(2). From what I have seen and heard of the government engineering colleges, the railway and private engineering workshops, there should be ample facilities in this country for the adequate training of students, but whether this work is made sufficiently alluring, I cannot say. I do know that there is no lack of intelligence amongst the youth of this country, and there is probably latent inven-

tive and designing genius that a proper training would in many cases bring out and develop.

(3). What has to be overcome, and it may prove rather difficult to commence with, is the objection of the better class students to manual labour. By many students, it is probably considered *infra dig.* to work in the shops with ordinary *mistris*, but it should be impressed upon them that this is the only way by which they could become masters of their profession, and qualify themselves for high positions in the engineering world. Further, the practical training, which is so necessary, only extends over a few years, is a healthy one, and the theoretical studies are, or should be in most cases, pursued during the same time.

(4). In connection with my works in England, we have for many years past instituted theoretical and scientific classes, allied with the South Kensington Institute, providing competent teachers and class rooms for the benefit of the apprentices or students who may be acquiring their practical training in our workshops. Whether this advantage is available at any or all of our railway workshops I am unable to say, although one would imagine it would be so, as it must be considered that the railway shops in India, with their up-to-date modern plants of machinery, should afford the best of facilities for a practical training.

(5). It has always been my wish to employ Indians at our various branches in this country, in responsible, as well as subordinate positions, but, unfortunately it has not been possible to procure Indian gentlemen with the necessary qualifications. In our business, which is of considerable magnitude, we frequently have to engage assistants from England. Owing to their ignorance of the country and language, it is naturally many months before they are of any real value to us; whereas, a properly trained competent Indian should in many cases be able to fill certain positions to mutual advantage.

(6). I take it it is the desire of government, as far as possible, to open up new fields of congenial employment for the educated classes in this country. It is with this in view that I have ventured upon the above remarks, and I respectfully suggest that increased facilities and encouragement for the training of engineers would lead to a new, or perhaps I ought to say, extended sphere of employment, that would not only be of incalculable advantage to many Indians, but to government institutions or private firms employing them.

(7). I am not unappreciative of the boon that this country has been to my firm in helping to provide employment for many of the 5,000 British workmen employed at our works in England. I have lived here long enough to value the industry, patience and many sterling qualities of the Indians, and particularly, at this juncture when their loyalty has been put to the test, and proved beyond our most sanguine hopes, it is the bounden duty of those of us who have lived and prospered in this country to do all in our power to assist government, either directly or indirectly, in bringing about a more happy condition for those who have to work for their living.

MR. J. HARPER called and examined.

2,003. (President.) The witness stated that he was the General Manager of Messrs. Marshall, Sons and Company, Limited, a firm of mechanical engineers which had their headquarters in Calcutta, and works at Gainsborough, Lincolnshire, England, and which supplied almost every class of motive power for industrial purposes including engines and boilers. The firm had specialized in machinery for tea gardens, and possessed a small workshop of its own for repairs to engines and boilers, but it did not manufacture any articles in India.

2,004. There was considerable scope in India in the mechanical line for fully-trained Indian engineers, and ample facilities existed for the requisite practical training. Mechanical engineering firms in India, such as those which were established in Calcutta, were willing to accept apprentices to a limited extent, to give them a course of practical training, but they were, at present, more in-

clined to help Anglo-Indians than Indians. The difficulty in obtaining a larger number of Indian mechanical engineers was largely due to their inherent objection to manual labour. His firm would be quite prepared to engage a limited number of competent Indian mechanical engineers, as it was a duty the firm owed to the country. Such training should give them confidence in themselves and thus equip them to practise independently. The witness added that if the Principal of the Sibpur College undertook to train a certain number of students as mechanical engineers, after ascertaining from him what qualifications were necessary, he would gladly consent to give such men a trial in his works.

2,005. From the fact that all the branches of his firm, viz., those in Calcutta, Bombay, Madras and Lahore, were obliged to recruit their employees from England, it was his personal impression that the training given in Indian

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colleges was not up to the required standard. His firm had supplied the Sibpur College with its motive power, and he had personally seen a synopsis of the course of instruction given at that college, but he had never examined the details sufficiently well to form an opinion as to their merits.

2,006. In his opinion mechanical engineering students while apprenticed to firms should receive a course of theoretical instruction somewhat on the lines of the night classes held in England. Similar instruction was imparted to men apprenticed to his firm's works in England, for which the firm provided class rooms and teachers for the benefit of the apprentices. These classes were allied with the South Kensington College, and only conducted night work after the day's work was done. He surmised that the difference in the climatic conditions of India and England might account for the failure of the night school system in Bombay, and suggested that the theoretical might be sandwiched into the practical mechanical training. Two to three* years' instruction in the two courses would be sufficient, but a five years' instruction would be preferable as in England. The difficulties experienced at present in arranging for practical training in engineering colleges should, he considered, be overcome. If it was not possible to sandwich the theoretical into the practical mechanical course the practical training should be given before the theoretical, and not after. His conclusions were that the ideal system would be a sandwiched course of a year and the next best, a course of practical mechanical work before the theoretical. A system of practical instruction in mechanical engineering, without a theoretical course which would appeal to the students, was, in his opinion, the worst form of training.

2,007. The witness here requested permission to remark on the question of the training of ordinary *mistris* and this was accorded. He mentioned that there was a great deal of intelligence in the *mistris* who, with improved educational facilities and environment, could be developed into a very good workman. His comment had reference to the ordinary fitter and mechanic engaged in the mechanical trades. His firm had had one or two remarkable cases of men who were merely *coolis*, but who, after a year's training in the firm's works, displayed extraordinary intelligence and were able to erect engines, start them and set right anything that required adjustment. There was a large demand for such material in India and he thought the supply was available, as his firm alone employed about forty in Calcutta, and in addition trained men to work machines in tea gardens, cotton-ginning factories, etc. He would like to see this class of workman given a course of theoretical training, and as government always encouraged industrial activity there was no reason why such a summation should not be reached seeing that the material was at hand. A preliminary general education ought also to be given to the workmen, as the majority of them were ignorant of letters. He felt strongly that if his suggestions were accepted and put into force a class of workmen would spring into being as good as any workmen of other nationalities, as Indians possessed intelligence and were industrious.

2,008. The institution of a school and its attachment to a firm's works would be excellent, as it was desirable to obtain workmen at an early age. He had not, however, given much thought as to the manner in which the education and training he had advocated might be given. He had never visited the technical institutes scattered all over India where the system he favoured was in force, but had seen all the English institutes. Although, when he visited Sibpur, he did not examine the class composed of the sons of *mistris* who were undergoing training there, he stated that he was very glad to hear that such a class existed at that college.

* Mr. Harper afterwards wrote:—If it would better suit the temperament of Indians, for a combined three years' course I would suggest the first year in the shops followed by six months' theoretical study, then another twelve months' mechanical and half a year theoretical, and so on, which would give the student two years' practical and one year theoretical for the complete instruction of three years.

2,009. The rules relating to the local purchase of stores were not strictly adhered to, and, as a sequence, articles were not purchased in India to the fullest possible extent. He had examined the rules, but was not able to indicate any particular restrictions from his point of view. He asserted, however, that the freer local purchase of stores in India would result in a saving in the expenditure incurred on their direct importation. Although he had not been resident in England for the past thirty years, he thought that similar conditions still prevailed in this respect. In his opinion, government could not purchase stores cheaper in England than in India because it had, perforce, to resort to middlemen. It would be better to purchase direct in India such stores as were supplied by his firm to the India Office as the expenses in England were very heavy. In his firm's works, for example, he did not think there was any department without an inspector. It was true that the system of direct purchase from England ensured good supervision and the efficient testing of materials. Such supervision and testing was necessary for materials manufactured by some firms, but was hardly necessary in the case of firms of high reputation, e.g., boiler manufacturers. For India boilers were made by his firm to government specifications and complied with the Boiler Commissioners' regulations and rules. These rules were really equivalent to the Board of Trade rules, and hence boilers manufactured for India ought to suit anybody.

2,010. The establishment, in India, of a government purchasing department was desirable but the head of such a department should possess some knowledge of mechanical engineering, and might be a high government official vested with powers in keeping with the importance of his position. The new department would act as an incentive to local industry, and lead to the freer purchase of Indian-manufactured articles, and the same tests as were in force in England, might be applied to such materials as iron and steel, cement, etc.

2,011. The appointment of a supervisory officer to check indents submitted by the Public Works and other departments, and to refuse to forward to the Secretary of State indents for articles that might be procurable in India would also be an advantage, but purchases from England could not be stopped suddenly, and would have to be abandoned gradually. A large number of articles of equally good quality, at present indented from England, could be obtained in India and departmental works were often held up pending the receipt of an article from England that might probably be obtained locally.

2,012. The increase in the local purchase of stores would eventually lead to the Stores Department of the India Office being transferred to India, but this change could not be introduced immediately as the classes of materials produced at present in India were comparatively small and it was not possible to procure in India everything that was required. It would, however, be possible for a buyer in India to buy as satisfactorily as the Director General of Stores, London. The best course to adopt, in the circumstances and as a preliminary step, would be to empower a competent government official in India to purchase such articles of indigenous manufacture as were required as also European stores stocked by manufacturing firms in India, and to give such an official the necessary staff.

2,013. (*Mr. Cobb.*) Government ought, he thought, to approach his firm in connection with the practical training of students in the Sibpur College, as he believed it desired to find work for these young men. He remarked that he had resided in India for a long while and had, therefore, become more sympathetic. In his capacity as manager of an extensive business he was anxious to lend young Indians a helping hand, and felt that something ought to be done for them. He had never had the opportunity of trying any of the Sibpur men as his firm did not recruit men in India, but remarked that this was exactly what he was striving to do. In spite of his earnest desire, however, he had never attempted the experiment, as it was only in recent years that Indians had taken to mechanical engineering.

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2,014. As attendance at the evening classes he had suggested would not be compulsory, it would not be necessary for the students to attend every evening. One or two evenings in a week should suffice, hence he did not think that the time would come when employers might have to allow apprentices to attend day classes, as was the case at present with some firms in England.

2,015. (*Rai Bahadur Ganga Ram.*) His firm had no experience of passed students of either the Sibpur or Lahore Colleges.

2,016. If a buyer was appointed in India with plenary powers, all the large manufacturing firms in England would naturally have representatives in India. Materials might be purchased at a cheaper rate in India through such representatives, in spite of the fact that the commission they would demand would be an addition to the value of the materials. Workshops in England were put to a great deal of trouble and expense consequent to the visits of inspectors and accordingly added a certain percentage to the price of materials to cover such expenditure.

Firms like his own would be in a position to keep on hand a larger amount of stock to meet government demands, and this would be of advantage to private industries. In India his firm usually had about £200,000 to £250,000 worth of machinery on stock at their various branches and if a buyer were appointed in India his firm would not only be able to supply machinery from this stock, but would also maintain a larger stock to the advantage both of the country and of the firm itself.

2,017. (*Sir Noel Kershaw.*) He stated that he would be pleased to get into communication with the Principal of the Sibpur College in regard to his scheme, and added that he might also visit Lahore.

2,018. There was ample time for his firm's apprentices to attend technical classes in England as the works closed at 5 o'clock in the evening. No classes were held during the summer, but only during winter evenings. These classes were advantageous, in that they kept the apprentices out of mischief.

MR. H. G. TOMKINS, C.I.E., F.R.A.S., Accountant-General, Bengal.

Written Statement.

(*Note.*—The views expressed in this note are purely personal and are in no way those of the Accounts Department.)

2,019. Prohibition against making payments during the last days of a month.—As far as I am aware, there is no rule or order of any kind making this prohibition. The propounder of the question has not shown why a contractor most needs the payments at the end of a month. My experience is that many firms have the 15th as a payment day, but, in any case, the question need not be considered as there is no prohibition as far as I know. I presume that a misunderstanding has arisen in the mind of the person who made the objection regarding a rule which exists about the closing of accounts and he has mixed it up with making payments. In the case of sub-divisions at a distance from the headquarters of the division it is necessary to close the sub-division accounts a few days before the end of the month, usually the 26th or 27th, so as to include them in those of the division for the month. April's books are therefore closed on the 26th or 27th April and the accounts sent in to the Executive Engineer, but this has nothing to do with payments nor does it prevent a payment being made on the 28th or 29th. In that case it would be included in the accounts for May. If any prohibition order of the kind has been issued in any province, it is in my opinion quite unnecessary and should be cancelled; but I am inclined to think that the idea has simply arisen from ignorance or misunderstanding of the orders.

2,020. Date prescribed for the submission of divisional accounts.—There is a certain round of account work to be performed, and it is approximately the same all the year through, except in so far as during the six winter months it is probably heavier than in summer, but this would not affect the question. The accounts are submitted monthly and they will have to be submitted once in the month for one month's transactions every month. So that between the two dates, whatever they are, one month's transactions will have to be got ready and sent in. I do not see, therefore, how the question of the particular date can have any effect whatever on the executive work as between these two dates. Precisely the same amount of work would have to be got through as at present.

(2). The Public Works accounts are sent to this office each month on the 5th of the next, and I am unable to see how this date can have any bearing at all on the executive work.

(3). The closing of the accounts is the work of the Accounts Branch, and not of the Executive Engineer or his executive staff, and as a matter of fact paragraph 1359, Volume I, of the Public Works Department Code provides for the submission of the accounts even when he is on tour. I am doubtful whether the trouble exists in Bengal at all, but if it does in any place, I am afraid

it must be due to the accountant neglecting his work during the course of the month, instead of keeping his books up-to-date, and then trying to do a whole month's work between the end of the month and the 5th of the next month. The proper method, however, is clear, and if the transactions were dealt with as they occur and not left over, the accounts should not take more than a single day to get ready and send in to the Accountant-General. Five days therefore is ample time.

(4). When once the transactions of a division are completed on the last day of a month, the executive should have no further concern with them nor can they effect the progress of the works in any way. If they do it points to bad management in the office.

2,021. Advances to contractors.—This is no account matter, but one of Public Works policy which is laid down by a Government of India rule. The present policy is against advances, but is not against payments on account, which are frequently made. Advances pure and simple may, however, be given by an Executive Engineer up to Rs. 50, or by government for a larger sum; except in this case it is not considered proper to advance money for no services or no material rendered, and provided the limit of Rs. 50 is sufficient to cover the cases of small contractors, I think the precaution is a wise one. It does not seem either necessary or desirable for government to advance sums of money to large substantial firms before any work is done, and it is only necessary in others when they are mere men of straw who have to get material for the work and cannot pay for it. This only occurs in outlying places, and the cases might be considered in order to see if the limit is high enough, but the requirements would usually be very small. In other cases, the condition that work must be done and measured up to enable payments on account to be made is a wise one, as it protects government from fraud by the contractors and irregular payments by Executive Engineers. Even with the rule in its present form, it is difficult to prevent most irregular payments from being made especially at the end of March. The matter however is merely one of policy and not of account.

2,022. Objections raised in audit.—Without instances of the objections referred to, or of the errors which the engineer thinks exist in audit, it is not possible to deal with this point. As regards errors in audit, perhaps Executive Engineers are not very competent judges, but I may say that, in general, objections arise from the failure to carry out sanctioned orders and rules made by government, or the Government of India. The objections therefore depend first on the rules and orders, and secondly on the extent to which they are obeyed or not. The conclusion one is driven to is that the executive have in the past freely disregarded rules and orders and object to be pulled up. If the objections really interfere with the progress of the work then there seems to be a case for the examination of the executive rules, which audit has to enforce, and possibly their relaxation. But

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I do not think the trouble is due to errors in audit, or if it is, then instances of those errors should have been stated to the Committee so that they could be examined.

2,023. **Commencement of the financial year.**—This is a purely imperial question, but I am unable to see what bearing it can possibly have on an Executive Engineer's work, unless instead of proceeding with his work as he should do and leaving the transactions to come into the accounts in normal course as they ought to do, he proceeds to work his arrangements to fit his allotments. And this he does very often, and it is precisely what the Government of India objected to during recent years. Normally the closing of a year ought not to have the smallest effect on an Executive Engineer's office or work. All he has to do is to go on with his operations and send in his accounts, precisely as in other months. It is the frantic efforts he makes to spend all his money, before the end of the year, that causes him the trouble. He would confer the greatest boon on all concerned if he would cease to do this. Whenever the year closed it would be no better, and if, say, December 31st were selected as a date, it might even be worse. The reason of the complaint is that the Executive Engineer finds it difficult to do both things at once, namely to carry on his ordinary work and also to arrange for the spending of money by the end of the year, and he thinks if he could put the latter operation off till he had less ordinary work to do, he would have more time to devote to his allotments, or at any rate the latter would not interfere with the former as is now perhaps the case. The remedy is for the Executive Engineer to cease trying to work up to his allotments, and to devote all his attention to his executive work, leaving the allotments to take care of themselves provided they are not exceeded. I have however a suggestion to make about these allotments further on which among other things will remove these difficulties.

2,024. **Payments in March.**—This question indicates a complete misunderstanding of "the evil of heavy payments" referred to. There is no objection, nor has there ever been, to heavy payments in March. They are largely due to the heavy working season, and are entirely unobjectionable if they are normal results of more work. What is wrong, and is open to serious objection, are the irregular practices continually being adopted by Executive Engineers to prevent grants from lapsing which they cannot properly spend. Such devices are for instance the issue of cheques for work *not done*, the cheques being kept in a safe for months because they are not due; false or improper measurements recorded in measurement books to enable cheques to issue for work not really measured up; payments to firms of large sums of money for which goods have not been received and sometimes not even landed in the country. These are what are objected to, and it does not seem to me that the budget system needs any change to stop it. When money cannot be spent, it must of course lapse, and the fact that lapses are frequent and large shows that much more money is given to the Department than it can properly spend at the rate of progress it is able to make. I have frequently noticed that towards the end of the year lakhs of rupees are transferred from education and other sources to the Public Works Department which it is quite certain at the time of transfer cannot possibly be spent. Yet this money is allotted and engineers are asked to spend it. It is the root cause of the whole trouble and should I think be stopped, money simply being supplied as wanted for works that can be actually and properly carried out to the extent required and no more. I have a suggestion further on to remedy this defect.

2,025. (*General.*) I now come to Mr. Milne's suggestion for simplifying the Executive Engineer's account work, and also to general proposals for compilation of the accounts in the central office, a separate accounts branch in the divisional offices, and local audit, which it will be convenient to deal with more or less together.

2,026. In this first place I think it will be desirable to make a clear definition of the accounts which are referred to in divisional offices, as a loose use of this term is very liable to cause misunderstanding and confusion of ideas. An Executive Engineer has three classes of

accounts: (a) his accounts relating to receipts and payments of money, (b) his technical professional accounts, and (c) the accounts which he submits to the Accountant-General. In the first class are included his cash book, cheque book, and pass book, bills, contractors' ledger, rent registers, etc.; in the second will be found his works register, schedules of rates, estimates, measurement books, and so on; the third class consists merely of his vouchers and returns for use by the Accountant-General in auditing and compiling the accounts of the province. In dealing with general suggestions for shortening the accounts, therefore, it is necessary to see exactly which class they refer to, and how each would be affected and it is not as a rule possible or even reliable to mix them up as they differ much, and are for various purposes.

2,027. Mr. Milne's scheme I think, from what he says, must refer mainly to the third class above, namely the accounts submitted to the Accountant-General. Now, in Bengal, as I have had the advantage of shewing the President and Secretary of the Committee as well as the Chief Engineer, Bengal, these accounts are very small and they involve practically no compilation at all. They consist merely of bundle of vouchers with the schedule dockets, of a few schedules in which are entered transactions such as stock transfers and of transfer entries in accounts, etc., which are book entries and do not involve cash payments (consequently there are no vouchers), and then a memorandum of receipts and charges in very simple form which brings these together and shews how the Executive Engineer stands. Besides this there is a covering list or invoice of the vouchers, etc., sent in so as to guard against loss of vouchers and that is all. I have a suggestion further on which will slightly cut down the number of dockets, but I think it may be said that in Bengal we have the absolute minimum of accounts which will enable the Accountant-General to check and compile the accounts, and the system has also been approved by the executive themselves in their committee recently held on certain proposals sent to Bengal by the Government of India.

2,028. Now with this minimum, it will not relieve the Executive Engineer in any way to have a central office under the Superintending Engineer, for if such an office were instituted, the Executive Engineer would still have to send this minimum of accounts to the Superintending Engineer, in the same way as he now does to the Accountant-General, unless the Superintending Engineer also took over the payment of contractors, etc. This would be clearly impossible. I think the suggested scheme has been based on the fact that the accounts are still compiled in some provinces to a considerable extent in the divisions before submission to the Accountant-General, but this has long been discontinued in Bengal, and even if the Executive Engineer sent his accounts to the Superintending Engineer, that office would merely be a post office and send them to the Accountant-General's central office where the compilation is done. I see no point therefore, in the suggestion, as far as Bengal is concerned, and it could not help the Executive Engineer in any way. I have also answered in the above, the suggestion (a) about the compilation of accounts in the central audit office. This is being done in Bengal, and has been done for the last five years. This disposes also of suggestion (b).

2,029. A separate accounts section in each divisional office already exists, however, though not to the full extent intended by the suggestion, and it is under a subordinate accounts officer, namely the accountant, who is specially qualified under account rules, and is appointed and controlled by the Accountant-General. I think I have shewn, as regards the accounts sent to the Accountant-General, that no particular object would be attained by the scheme suggested by Mr. Milne. As regards the other two classes of accounts I do not see, for practical reasons, how either of them could be transferred to the Superintending Engineer. The Executive Engineer must obviously both pay his own contractors on the spot and also keep his own professional accounts in his own office. If he does this, he must render an account of his transactions, and I have shewn above how this is done in Bengal, and that the suggested alteration would not help him in any way.

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2,030. I also think that the suggestion that the Executive Engineer be reduced to the position of a sub-divisional officer would be a mistake ; and even if this were done, it would only result in transferring the present difficulties (if there are any) to the Superintending Engineer, and would not get rid of them. Further, I think it would be highly undesirable to take away the accountant from the Executive Engineer, or to reduce his status. The accountant is of course a very useful agency for the preparation of accounts sent to the Accountant-General, but a glance at the classes I have given above will show at once that these are by no means his most important work.

2,031. He is undoubtedly necessary most to the Executive Engineer in connection with the payments of money which have to be made, and the check of contractors' estimates and bills. For this purpose, a well paid man is in my opinion essential in order to place him above corruption, and I am against removing from the Executive Engineer the assistance which I think is essential to him in this matter. Hardly less important are the technical accounts, and here again the technical qualification of the accountant is essential as on these professional accounts and data estimates, rates, plans and all manner of other information used in the execution of works are based. It is highly desirable, in the interest of economy and efficient work, that these should be reliable.

2,032. I am afraid therefore that Mr. Milne's suggestion would not have the advantages he anticipates as far as Bengal is concerned, and I do not think the idea of removing the accountant would work. I come now to the question of a travelling local audit of all the accounts on the spot. This is attractive, and in Bengal we have carried it to the practical limit, I think. It would become prohibitive, on the score of expense, to adopt the system completely, nor would it have any advantage. On the other hand, it would have some serious drawbacks. In Bengal, when the accounts were revised by me in 1912, two objects were kept in view (1) to abolish the submission to the Accountant-General of all accounts and returns which were not essential to audit and compilation and (2) to transfer as much audit as possible to local audit on the spot. Local audit was substituted whenever copies of documents or registers had hitherto been submitted, as I hold the audit of copies of accounts to be a weak form of audit, and it is better in my opinion to audit the books themselves on the spot, even though the audit may be once a year and not continual. In accordance with this the following were brought under local audit in place of the old central audit :—

- (a) The contractors' ledger.
- (b) Rent returns.
- (c) Stock accounts.
- (d) Tools and plant.
- (e) Half-yearly stock return.

The copies of all the accounts were of course abolished.

2,033. The following were also abolished under (1) above :—

- (a) Letters of credit, with all connected forms and returns except a very simple resource estimate to enable the treasury to supply funds.
- (b) Form 32 O.
- (c) Schedule of establishment charges.
- (d) List of petty works.
- (e) Transfer schedules, which were reduced from 6 to 2.

2,034. The account-current was also abolished and in its place a simple memorandum of receipts is used. Acquittance rolls are retained in the Executive Engineers' own offices. They are the personal acquittances to the Executive Engineer, and I am unable to understand why they were ever sent to the central office (*vide* Article 63, Civil Account Code). What we are left with in Bengal, therefore, are simply the payment vouchers and the book entries which come to the Accountant-General, and these are original documents and consequently proper to audit. They, or some substitute for them, would have to come to the Accountant-General monthly, in any case, to enable him to compile the accounts, and there is no object, therefore, in not also auditing them in the central office,

2,035. It will thus be seen that, in Bengal, we have a combination of suggestions (a) and (c) and experience has shown it to be efficient and economical. It also involves the submission by the Executive Engineer of the minimum of accounts and returns to the Accountant-General, and he would have to submit them to some one whatever scheme might be adopted, as it would otherwise be impossible to compile the accounts at all. I should like to say that, from the accounts point of view, divisional officers have worked the scheme in a practical and satisfactory way, and to this much of its success has been due. It met with some opposition for a time, as some of the changes were drastic and caused a certain amount of alarm, especially in the matter of the transfer of accounts to audit on the spot. Similar alarm has been expressed also, I think, in some other provinces over analogous suggestions, but actual experience in Bengal has shown it to be groundless, and after a trial of five years I am glad to see that it has been accepted by the committee of engineers, recently appointed, as satisfactory. I have now a suggestion to make to the Committee by which I think Executive Engineers could be set free from a very large amount of work, worry and needless restriction. It is in connection with what are known as allotments.

2,036. I will first briefly consider the principle of allotments, as it has a very important bearing on the subject. The government of a province in their financial scheme for a year provide under Public Works heads for certain expenditure. They do not go into great detail, and when the financial programme has been settled they hand over to the Chief Engineer (who is also a Secretary to Government in the special Department of Public Works) the whole sum provided for use, leaving it to him to distribute the money to the officers under him throughout the province. He divides this up among his Superintending and Executive Engineers, and this is the process of allotments.

2,037. Now, from the fact that Executive Engineers are expected to keep within their allotments (and we object in audit if they don't), and also from the fact that allotments are very often increased and engineers are urged to spend them in the year, a popular idea has grown up that these allotments are a means of controlling expenditure, and the operations of the Executive Engineer. I quite agree that the allotments do often restrict an Executive Engineer, and they also cause him much worry and needless work. But I do not believe that they really control expenditure, in the sense of promoting either economy or good work ; in fact, if they are more than an engineer can conveniently deal with, they do the reverse. My view may perhaps be that of the man in the street, but it is that control over an engineer's expenditure should be exercised by means of (1) evidence of the necessity, or otherwise, of the works, (2) by the estimates for these works, if the latter are necessary at all, and (3) by the inspection of the work done. In my opinion the provision of funds should not affect this question at all, but be completely apart from it. Of course, if there is not enough money for a work it should not be sanctioned, or should be postponed by the sanctioning authority ; and on the other hand if there is money to spare, schemes can be taken up which would otherwise have to wait ; but the progress of works or repairs should not depend on petty allotments or restrictions, as far as the Executive Engineer is concerned. These things serve no really useful purpose that I can see, and they impede progress and make work. The object of the allotments is to distribute money provided for the works actually being undertaken, and this distribution should not be carried down to sums of Rs. 50 or Rs. 100 when the amount involved on the whole is lakhs of rupees. An excess or deficiency of such small amounts can have no practical effect on the whole, and it comes, in my opinion, to over-attention to petty detail.

2,038. The idea, therefore, that an allotment is to be a means of control over individual works should be strongly discountenanced. Such control should be exercised through the estimates, and by inspection of the works, as well as scrutiny of the actual payments. The

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allotments should be merely a means of distributing money and of financial administration, and they should not be allowed to go beyond their sphere. On this principle, I now suggest that allotments be discontinued to Executive Engineers altogether, and that they be freed entirely from the restrictions and work connected with them. In other words, the Executive Engineer should satisfy himself of the need of a work, submit his plans and estimates to the Superintending Engineer, who will sanction them, and give him such directions as to beginning the work or not or the progress to be made, as he may think right. I refer to this further on. This will be the engineer's authority (together with administrative sanction) for taking up the work, and he will then simply carry it out and pay for it by cheques on the treasury, regardless of whether there is money provided for it in the budget or not. In fact he will have no responsibility or concern whatever either with grant or allotment; he will have neither, nor will they appear in his books at all.

2,039. I come now to the allotments and financial administration of public works. The allotments should be carried as far as the Superintending Engineer, and no further. The Chief Engineer would divide up his money between the circles under him as required, and place the whole sum at the disposal of the Superintending Engineer. This can be done of course with restrictions, if thought necessary. For instance, the sum would be divided between irrigation and buildings and roads, even if the Superintending Engineer administered both, and he would not be allowed to appropriate one to the other.

2,040. Similarly, the division could be taken further and roads separated from buildings, and so on; but I would not carry the divisions too far, and certainly not down to works of ordinary size or importance. The Superintending Engineer should have a sufficiently large lump grant to enable him to administer effectively the funds among his divisions. They would be lumped together, and he would not allot money to each division or work at all, but would keep it in lump, and book expenditure against this lump sum, thus avoiding any necessity for reappropriations between either divisions or works.

2,041. To enable the Superintending Engineer to carry out this work it will be necessary for him to be kept fully informed by the Executive Engineer of the progress of work, and this will be possible with a slight modification of the present progress report, the columns relating to grant and allotment being struck out and a column for the estimate of expenditure for the next month inserted. From these reports the Superintending Engineer should be able to regulate his funds. He will not be troubled with small sums as in lump allotments they merge and disappear.

2,042. It will be necessary for him to work to a certain extent in collaboration with the Accountant-General; that is to say the Accountant-General will watch the progress of expenditure as he does in the Civil Department and warn the Superintending Engineer if it is going too fast on an average for the time of the year. The Superintending Engineer will then be able, in time, to examine his figures and take what steps he thinks necessary. The warning does not amount to an objection, but is merely to put him on his guard. If he is running short of funds he will either ask the Chief Engineer for more money or else direct his Executive Engineer to slow down; on the other hand if he is going too slow, he will sanction more work or perhaps expedite progress of existing works. He will not however tell the Executive Engineers that they must spend this or that sum. The Executive Engineer will not be responsible for getting rid of money or for saving money, but for doing work. For the same reason the Executive Engineer will not be bound to his forecast in the progress report, though doubtless, if he were habitually out in his forecast, the Superintending Engineer would request him to take more care.

2,043. To enable the Superintending Engineer to perform efficiently the work suggested, it will be necessary to give him a reliable accountant, and this will be the entire cost of the scheme. Even if no reductions can be made elsewhere, the advantages greatly outweigh the

expense, but I am inclined to think that with the reduction which this scheme and other changes have effected or may effect in Executive Engineers' offices some decrease in staff may be possible as a set-off against the cost in the Superintending Engineer's office. I am not now referring to the Executive Engineer's accountant or higher staff, but to the lower paid men who are mostly engaged in copying and routine. The object of many of the suggestions is to cut down routine and if this is done, there is likely to be saving.

The result of the scheme will be—

(1). A reduction of detailed work in the Secretariat connected with the granting of allotments. These will not now be wanted.

(2). A slight increase of work for the Superintending Engineer, but with a good accountant this will be more in the shape of responsibility than actual work. The Superintending Engineer will not think in small detail but in fairly large units and this should not create any great mass of work.

(3). An enormous reduction both in work and worry for the Executive Engineer, thus enabling him to devote himself entirely to his professional work.

(4). A very large reduction in objections from this office and correspondence connected with them.

Last year these objections in Bengal were 762 in number, and the value exceeded 24 lakhs of rupees. They will entirely disappear.

(5). The administration of funds in larger units than at present, and consequently saving in work to all concerned, from the Secretariat downwards. For instance, an excess over an allotment of say a hundred rupees now frequently involves correspondence asking for sanction to the excess and re-granting it. This will disappear all down the line.

(6). The difficulties referred to in paragraphs 2,022 to 2,024 above will disappear. As the Executive Engineer will not have any allotment he will not have to make efforts to spend it, or on the other hand to curtail progress for the technical reason of a small excess.

(7). The whole scheme will make for elasticity and broader control. Attention which is now devoted to petty detail will be given to larger issues, and the Executive Engineer, instead of being a slave to small affairs of a few rupees, will be set free to get on with his work independently of the supply of grants while the Superintending Engineer, in administering the grant, will deal in large units and broad technical control.

(8). The time and energy of all officers from the Chief Engineer down instead of being taken up, in varying degrees, by small and routine sanctions, the reappropriation grants, objections, and correspondence, will be free for application to larger and more important matters, and in the case of Executive Engineers probably more inspection and control of the actual works.

2,044. It will be understood, of course, that the above is a skeleton scheme and that details will have to be filled in if the principle is accepted. For instance, among other things, it will be necessary to decide with the local Government and Chief Engineer whether the grant to the Superintending Engineer should be in lump, or, if not, what division should be made. Also forms for the Superintending Engineer would have to be devised to enable him to administer his grants, and arrangements will also have to be made between this office and both the Chief Engineer and the Superintending Engineer about the alteration in present audit procedure and grant control. These are, however, details and I suggest the scheme in outline for the present.

2,045. I have also a second suggestion which is a much smaller matter than the above. It is the custom now to have separate estimates for repairs to each building, etc. I suggest that these might with advantage be lumped together, at any rate for different departments. Thus, all the police buildings could go together, and so on. This will reduce a number of schedule dockets, and also the covering list of vouchers now sent to this office, thus slightly cutting down the work in the division, and it would also reduce detail in the Executive Engineer's books.

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[Continued.]

MR. H. G. TOMKINS, called and examined.

(Note.—The views expressed below are purely personal and are in no way those of the Accounts Department.)

2,046. (President.) The witness stated that he was the Accountant-General for Bengal, and as such was in charge of the Public Works Department accounts in the same manner as the Examiner of public works accounts used to be before the amalgamation of those accounts with the civil accounts.

2,047. As far as he was aware, there was no prohibition in the accounts rules against making payments during the last few days of a month, and there was absolutely no necessity as far as he could see for the practice if it obtained in any province.

2,048. He did not know of any province in which payments were not allowed between the date on which the accounts of divisions were closed and the beginning of the following month. The date fixed for the closing of divisional accounts was never intended to prohibit these payments, had no connection with the payment work at all, and was only intended to draw a dividing line between the accounts of two succeeding months. The same rule existed in respect to sub-treasuries all over Bengal, and as far as he knew, all over India, and payments after the prescribed date were not prohibited. The specified closing date in Bengal was the 25th, as it was found convenient, and after that date the first transaction for the succeeding month could take place on the 26th. At the end of March, however, latitude was allowed in April to Executive Engineers in Bengal to enable them to include all their March figures.

2,049. In his opinion the 25th, as the date fixed for the submission of accounts, should not make any difference in the matter of the submission of the accounts of divisions, and there was no reason why such submission should be difficult on this account, as was contended in several provinces, where sub-divisional officers, as disbursing officers, were said to be unable to submit their accounts to the Executive Engineer on this date, and required two or three additional days for the purpose. There was also no good reason for fixing an earlier date. The 25th had been fixed as a matter of convenience, but in the case of some divisions which were in a near sub-division the 28th had been chosen, while in cases of others situated in a far away sub-division sometimes the 21st or 22nd had been fixed. It was possible for the Executive Engineer to prepare the monthly accounts of the division before the receipt of the sub-divisional accounts, but such a procedure, he remarked, would certainly not commend itself. Therefore, in order to avoid congestion of work, which would necessarily result from too short a period between the date on which the Executive Engineer received the sub-divisional accounts and that on which that officer had to submit the monthly accounts of the division to the audit office, it should be arranged that the sub-divisional accounts should be sent in in such a way that they might be in the Executive Engineer's office on the last day of the month. This was the reason for fixing the 25th in Bengal. The divisional office accounts would by then be well advanced, and the Executive Engineer ought to be able to submit them to the audit office by the date fixed, viz., the 5th of the following month, as he considered, the period between the end of a month and the 5th of the following month was ample.

2,050. The difficulty anticipated in fixing a later date than the 5th for the submission of the divisional monthly accounts was that these accounts would require to be audited after posting, and that was a serious objection. The reason why the 10th was chosen in other provinces, and was considered too short a period for the purpose, was probably that in those provinces a certain amount of compilation was done in the executive office, whereas in Bengal all the compilation was done in the Accountant-General's office and none in the division. All that an Executive Engineer had to do in Bengal was to bundle up his vouchers, make up covering lists with the necessary memoranda and send them in to the Accounts Department. This work he thought might be done in twenty-four hours. Before the amalgamation of the civil with

the public works accounts, the date fixed for the submission of the divisional accounts had been the 20th, and accounts submitted on that date were closed by the late Examiner on the 20th of the month following. The present speeding-up by the change from the 20th to the 5th was necessary because the Accountant-General's office itself had been speeded up by a whole month and submitted provincial figures, accounts and budgets to government one month earlier than was the case under the old system. He deprecated any extension of the date beyond the 5th, firstly, on the ground that it would give the accounts office insufficient time, and secondly, that it would dislocate accounts work and reduce its efficiency. It was necessary for his office to go through all the vouchers received, and it would rush accounts work very much indeed, his office having not only to compile, but also to audit the monthly accounts. He was of opinion that if the Bengal system were adopted the divisional monthly accounts might easily be submitted on the 2nd, if it was assumed that the sub-divisional accounts were received on the 1st, and that compilation of these accounts ought not to be undertaken in executive offices in other provinces. The 5th therefore gave ample time and was actually in force in Bengal.

2,051. With reference to the contention that paragraph 779 of the Public Works Code, which prohibited advances to contractors, hampered to a certain extent work which might be carried out more cheaply and expeditiously if larger advances than Rs. 50 (paragraph 780) were allowed for material and other outlay incurred before work started, he remarked that there was no accounts principle involved in this prohibition of advances. It was merely a matter of policy, and the only question which affected the Accounts Department would be the liability of fraud. From an accounts point of view advances were undesirable because they required watching. It was not a very serious matter, however, as there were always a large number of advances outstanding in the civil accounts, and a similar state of affairs in regard to the public works accounts would not make much difference. If advances were permitted, he considered that from an accounts point of view they ought not to be so unduly large as would make them figure under the name of 'dangerous financing.' Large advances to contractors who were not part of government might lead to this. He did not see any objection, however, to the principle of small advances, and mentioned that the prohibition in the Code was simply a Government of India restriction. Further, if government were to finance small contractors in the *mofussil*, who were at present financed by money-lenders, he agreed it might result in cheaper work, and mentioned that during his eleven years' experience of petty contractors, in connection with the audit of local boards and municipalities, he had found that generally it was necessary to advance small sums of money, and that when this was not done no contractor could be secured to do the work. He would, however, draw the line at the grant of advances to recognised firms of standing, e.g., a large Calcutta firm which was capable of undertaking a contract for a telegraph office or other large public building, as he considered that such a firm should not be accorded the concession.

2,052. The second of the three heads into which he had divided accounts in his written evidence, viz., technical accounts were, he explained, those accounts of the Public Works Department which were kept for its own information, and a justification for keeping details of works by various sub-heads in the register of works was that the Executive Engineer might through this medium possess full information regarding the progress of works. In respect to this register he remarked that, speaking as an accountant and looking through the register of works as the man in the street would do, it did seem to him to be elaborate, and he had always thought some of the heads in it might be cut down, but it was difficult for him

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to express an opinion when experts existed who said that they wanted these detailed registers. This was really not a question that interested the Accounts Department at all, and though the registers appeared to him to be large books, which, he thought, would be the better if they were smaller, he was not prepared to state, against the opinion of an expert engineer, that only certain sub-heads which would enable an engineer to watch the progress of works were wanted. The report sent in by every Executive Engineer, to the Superintending Engineer, showing the latter how each particular work was progressing, was known as the "Progress Report." This report did not contain a mass of detailed sub-heads, but only a total, and consisted of one line for each work. It would not be desirable for a sub-divisional officer to submit similar reports to an Executive Engineer, as the latter was the man technically responsible for each work and naturally desired full information regarding details to be furnished. As the Accounts Department were not concerned or interested at all in these sub-heads in the register of works, there was not the least objection, from an accounts point of view, to the suggestion that sub-heads might be abolished for the majority of minor works, and kept only for works exceeding Rs. 10,000 and not, as at present, for works exceeding Rs. 2,500.

2,053. The compilation of accounts in Bengal had been reduced to practically four forms, *viz.*, the schedule docket, vouchers of payments, the schedule containing a list of vouchers and simple money accounts and the schedule for large transactions. That number was the minimum of forms to which compilation might be reduced, though the schedule docket might perhaps be cut down to a further extent. The new system of compilation had been in force since the 1st of April 1912, and as far as Bengal was concerned it had worked absolutely satisfactorily. It was unnecessary, he thought, from an accounts point of view, for Executive Engineers in other provinces to submit about twenty-three forms with every set of monthly accounts, as no difficulty was ever experienced in Bengal after the abolition of the greater number of these statements. In regard to the abolition of Form No. 32-O the Accounts Department, Bengal, and Executive Engineers sometimes differed as to its utility. The former considered it a useless form for the purpose of accounts, but some executive officers found it very handy and convenient. Form No. 32-O had not been in use in Bengal for the past five years. The existing scheme for the compilation of accounts in Bengal was drawn up by him in communication with certain Executive Engineers and other officers, and was drafted with the help of an able Public Works officer. Since its introduction one or two modifications had been made in it. It had been introduced by a circular letter issued by him, and was not connected with any general scheme at all. The Comptroller-General at that time desired to extend the scheme to other provinces, and had circulated copies of circulars and reports and requested other provinces to take up the matter. Owing to the opposition it met with and other causes, various modifications were made and so a different procedure came into being in nearly every province in India. Later on a conference of accounts officers, under the chairmanship of the Comptroller-General, was held in 1914 to consider details for a unified system of accounts for all provinces, and the result of this conference was that a scheme had been recommended, which was largely a compromise of the various provincial schemes. The report had been submitted to the Government of India, who, he thought, had circulated it to local Governments and Administrations for opinion, but he did not know the present stage of the case. He understood that Bengal did not want any change at all in its system.

2,054. The net amount of expenditure on buildings and roads placed under audit objection in 1915-16 was Rs. 28,72,000, and the percentage that these objections bore to the total expenditure was 44.4. The objections comprised—

	Rs.
Works carried out without any estimate	15,53,000

	Rs.
Excesses over estimates	4,49,000
Expenditure incurred without any appropriation	17,02,000
Excesses over appropriations	3,29,000

He added that if the general scheme outlined in his note were introduced, and allotments were abolished as he had suggested, the number of objections would be reduced to nearly half, and the percentage to 22 instead of 44.4, *i.e.*, expenditure to the extent of Rs. 14,00,000 would be removed from audit objection. The objections related mainly to estimates and appropriations, and the number of grave irregularities was very small. In regard to the complaint that accounts officers unnecessarily objected to variations between the rates shown in estimates and the schedule rates, and called for explanations as to the reasons for the differences, he remarked that in the central audit office in Bengal neither estimates nor rates were audited, as neither the one nor the other were submitted to the Accounts Department.

2,055. Tests, for the information of the local Government, were applied in connection with the local audit carried out in Bengal, *i.e.*, it was seen that various requirements of government were complied with according to rules, and this was reported on in an audit note. This note included criticisms of rates and was an advantage from the accounts point of view, as otherwise he did not see how the local Government would know whether its rules regarding rates were being adhered to. If, however, the local Government did not want this done, it might be dropped as it was only done for the information of the administration. If it was found in the course of local audit that, for instance, the schedule rate for masonry was exceeded in an estimate, this would not necessarily be a reasonable ground for an audit objection, but in certain circumstances it might be. If it was simple petty increase, no objection ought to be taken to it, but the Accounts Department invariably brought to notice a really serious excess over an estimated rate, *e.g.*, if for a large work involving a large sum of money an Executive Engineer, without the prior sanction of the Superintending Engineer or government, accepted a considerably higher rate than that laid down in the schedule of rates, an accounts officer would certainly hold that such a case should be referred to the Superintending Engineer or to government, as the case might be, for sanction and approval. Although the schedule of rates was only a general guide, it required the approval of the Superintending Engineer. He added that except in cases where it was anticipated that government stood to lose and the rates had a tendency to rise and vary considerably from the schedule rates, discretion was largely exercised at present by audit officers. A particular rate in a particular estimate might be objected to if that rate involved a large sum of money, but if on the other hand it did not involve very much expenditure it would not be objected to. For instance, if an estimate for Rs. 40 worth of white-washing varied by a couple of annas the accounts officer would ignore it, but if for a large office building the variation in the rate made a difference of Rs. 10,000 or Rs. 15,000, this ought certainly to be objected to.

2,056. Local audit in Bengal was carried out once a year on an average, unless it was found necessary to repeat it for a particular division, and covered totally different ground to the monthly audit. The monthly audit was carried a little further in some cases and such matters as salary and travelling allowance bills were examined with a view to see that none of the prescribed rules had been infringed. But local audit concerned itself with matters which could not be looked into by reference to the documents submitted to the accounts office, such as the contractors' ledger, the rent returns and the stock and tools and plant returns. Those documents were formerly submitted to the central accounts office, but their submission to that office had been discontinued.

2,057. He was not in favour of the introduction of a peripatetic audit system with a view to the reduction of

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audit objections as such a scheme would, in the first place, be extremely expensive and as secondly, as far as Bengal was concerned, it would not relieve the Executive Engineer. He met the contention that such a system would lead to the removal of a large number of audit objections with the remark that he doubted whether the proposed system would even result in the partial reduction of the number of objectionable items as objections were recorded in writing and could not be settled orally without record. Practical experience had shown that it was impossible to settle objections without record as they frequently remained unremedied if this were done and the fact that they had been raised was often subsequently contradicted. Objections were, therefore, placed on record and, as the volume of actual writing would be the same, the chief difference that would result would be the saving in postage. Then again, the expenditure on the travelling allowances of the auditors would probably double the cost of audit and amount to a high sum. Local audit was a good form of audit as by it a great deal more could be learnt than by a central audit, but it was nevertheless very expensive. The local municipal audit done in Bengal afforded testimony of its efficiency. In the circumstances, he was opposed to the system of peripatetic audit suggested by the Comptroller of the Central Provinces, and added that the present annual inspection was practically a form of local audit. A monthly travelling audit scheme would be more expensive, and would necessitate the employment of more officers and about three times as many clerks as were engaged at present. In addition to this, the travelling allowances of the additional establishment would lead to extra expenditure. Further, local audit carried out by a travelling staff, as a regular scheme would be more difficult than that carried out in the central accounts office, because bulky registers of accounts were maintained for the posting of expenditure and noting of grants, etc., and these books would require duplication which in its turn would involve a large amount of labour. The entire scheme in his opinion was cumbersome and the only advantage that might be gained was a very slight but problematical reduction in the number of objections.

2,058. He suggested a scheme which involved the abolition of allotments to Executive Engineers, and mentioned that its introduction would undoubtedly give very great elasticity to those officers, who would not be bound down to specific allotments for works under construction, but would be responsible only for their execution. As the Executive Engineer would have a free hand under his scheme to expedite the completion of works the necessary check on divisional outlay—since the amount available for expenditure in the budget was limited—might be exercised by the Superintending Engineer, in whose office a capable accountant could be placed to assist in the maintenance of the necessary accounts and books. Such an arrangement would enable the Superintending Engineer to scrutinise, at any moment, the progress of the expenditure in his circle as compared with the allotment assigned to him by government for his circle and thus regulate his sanctions to new estimates. Further, the Superintending Engineer might be given the list of estimates on which the regular budget was prepared, and authorized to order the commencement of work. The proposed system would, in practice, then do away with the allocation of funds to particular works, and automatically remove audit objections relating to the reappropriation of funds as work would be done to a total allotment instead of to a large number of individual allotments. As his proposal gave the Superintending Engineer an absolutely free hand in deciding the respective degrees of urgency of projects without consulting the wishes of administrative departments, there was a possibility of the Superintending Engineer exercising that discretion unwisely. For instance, if two roads, each with an allotment assigned to it in the budget, were under construction for an administrative department, and the one of greater urgency had a larger allotment assigned to it than the other the Superintending Engineer with his plenary powers might for the

convenience of his work, stop the construction of the former and give a larger allotment for the latter; but such a contingency could be obviated by the submission to the Chief Engineer of a return of important works showing their progress. There was no need to watch the progress of works by allotments assigned to each. A list of works for each circle with no appropriations attached to individual items would serve the purpose, and if it were found therefrom that a Superintending Engineer was giving preference to one work at the expense of others it could be brought to his notice. There was no use, he considered, in exercising administrative control by restricting everybody from top to bottom by allotments and reappropriations. Many present objections would adjust themselves automatically under the new scheme and questions of reappropriation of budget grants which usually occupied a long time in settlement would disappear. Speaking from an administrative stand-point, he remarked that in practice the giving of allotments for each individual work before its commencement was not really done, and that if it were attempted to enforce the rule that an Executive Engineer was in no circumstances to start a work until funds for it had been allotted, works would in many cases be at a standstill.

2,059. In regard to the contention that delay in the progress of works was sometimes due to late sanctions to allotments, he stated that there might be a rule in Bengal permitting an Executive Engineer to incur expenditure without allotment in the months of April and May, but he did not think that that was the case. He added that the point was exactly what his scheme ensured, as it avoided marking time in the first few months of a year till budget allotments were made known, and compelling an Executive Engineer to wait till their receipt. If Executive Engineers were permitted to incur expenditure during these months they would be acting as he had proposed, with the difference that his scheme referred to all the months in the year and not only to April and May.

2,060. With reference to the argument that it was not possible to arrange for new works before the rainy season as the programme of new works with the allotments assigned to each was not received in divisional offices till some time after an official year had started, he stated that the date of publication of the Public Works Department budget varied. As the budget was not actually communicated to Executive Engineers till May or June, those officers were without budgets during the first month of the year. The position was the same in the Civil Department, but if the giving of allotments were discontinued the disabilities complained of would disappear automatically and it would be immaterial to Executive Engineers whether allotments were sanctioned in the months of May or June, or not at all, as the budget grant for the year would suffice to cover the anticipated expenditure during the year if the Superintending Engineer took care to ensure that the grant placed at his disposal was not very much less than what he had asked for in his schedule of demands. (Mr. Green here mentioned that the budget was published in Bengal about the 15th of May when it was officially communicated to Executive Engineers and that ordinarily he wrote demi-officially to Superintending Engineers a month previous to the passing of the budget informing them of the retrenchments made and the sums they might expect to receive and that this practice was not in force formerly. He added that Superintending Engineers were authorized to proceed with work from the date they received orders for its commencement from the Chief Engineer and Secretary to Government. The witness here interposed with the remark that the budget was passed finally during the last ten days of March, and Mr. Green observed that by communicating official orders to Superintending Engineers early in April, Executive Engineers were not now hampered in their work.)

2,061. (Sir Noel Kershaw.) The witness did not know the accounts procedure in force in other provinces and he believed his scheme had not been completely adopted in any one of them. He was not aware of any reason why

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it should not be considered suitable for other provinces, but admitted that local difficulties of which he was not cognisant might impede the introduction of the Bengal scheme. Personally he attributed the variations between the systems followed in provinces largely to sentiment, as one of the results of the amalgamation of the Civil and Public Works Accounts Departments was that the Public Works executive officers came under the audit of the Civil Accountant-General and those officers had not always taken kindly to the arrangement. The Public Works Department officers had proved very conservative owing to the drastic changes the scheme involved.

2,062. The conference he had previously referred to was convened to consider the question of the unification of accounts, and met in Calcutta in March 1914, after his scheme had been in operation in Bengal for about two years. It was a purely departmental committee composed of accounts officers, and no oral evidence was taken. Each province had been requested to record their objections to the scheme, and these were printed up and placed before the committee, so that Executive Engineers had an opportunity to voice their views, which they did, probably after discussion with their own accounts officers. He could not say definitely how a homogenous system might be secured, and thought the best and only way to attain uniformity was to ride rough-shod where necessary. If, however, an accounts officer was deputed to discuss local difficulties with the officers concerned, it might remove some of the existing prejudices against the Bengal scheme, but there were always some officers—doubtless, very few—whom no amount of discussion would convince, and in their case compulsion was the only form of suasion. The five years that had elapsed since the introduction of the Bengal scheme had effected a good deal in its favour in Bengal and difficulties had now disappeared. He did not favour the appointment of a committee before which one or two Executive Engineers from each province might be summoned, with a view to the formulation of a homogenous scheme, but was of opinion that the best means of securing this end was for an accounts officer to go round to the different provinces to look personally into matters and make sure that the persons who required convincing understood where the difficulties lay. Personally, if he had to go round in such a way he would select, in preference to a committee, an able Public Works officer to go round with him and discuss matters personally and locally.

2,063. The objections raised in local audit in respect to rates, and the questions whether government money had been spent in the interests of the public service were of a general nature, and the Executive Engineer's explanation to an objection was accepted by the central accounts office provided the sum involved was not very large and it was within the competence of the Superintending Engineer to pass. There had been a diminution in the number of objections, under the local audit system in force in Bengal, but this system could not be applied to the accounts audited in the central office. He was opposed to the oral settlement of objections as the practices they involved might be continued and there would be no record to show they had been brought to notice on a previous occasion. His view did not apply only to a particular class of officer, but to the service generally. The practice was analogous to that followed in the Civil Department in which department it had been found that when questions had been settled orally the Accounts Department were sometimes informed subsequently that it had not raised the objection previously.

2,064. The distinction in the Appropriation Report between frauds and irregularities was that a fraud comprised loss of money or material, whereas an irregularity was anything short of this. For instance, if an inspecting officer whilst conducting an inspection noticed that a large number of bills had been paid during the month of March for which measurements had ostensibly been made, and on further examination found that the measurements could not possibly have been taken by the officer concerned owing to his absence at the time from the

station, it would constitute a serious irregularity, but not a fraud.*

2,065. It was unnecessary for an Executive Engineer to sign all the forms submitted with his monthly accounts, and it would suffice if only a covering memorandum were submitted stating that all the forms included were passed by him. The fact that an Executive Engineer had or had not signed did not make any great difference as every officer was responsible for what issued from his office. His signature afforded testimony to his general approval of its contents, and correctness of the form signed, but a covering memorandum would also indicate this. He would like to give the matter some thought, however, before deciding definitely whether there was really any force in the objection to the signing of accounts documents by executive officers, but added that the matter was a small one in Bengal in which province only five or six signatures were necessary and where probably Executive Engineers might for their personal satisfaction prefer to examine and sign these few forms before their submission to the Accountant-General's office. As the divisional accountant was not a gazetted officer and not in sole charge of the accounts of the division, he did not favour that officer being allowed to sign the monthly accounts forms.

2,066. (*Mr. Mackenzie.*) As the majority of objections did not relate to frauds and serious irregularities most of them were remedied at an early date, but a great deal depended on the class of objection. Under his scheme, the Superintending Engineer would not make specific allotments for individual works from the funds placed at his disposal and as a result of this about half the number of objections would be removed and the remaining 22 per cent. would then relate to works for which no estimates had been sanctioned, and excesses over estimates. Of the objections raised in the year 1915-16, items aggregating Rs. 15,50,000 were due to want of sanctioned estimates or appropriations. The figure of Rs. 15,50,000 included cases in which no appropriations had been sanctioned and allotments had been exceeded. The excesses over appropriations aggregated Rs. 3,00,000 and the remainder of the items referred to expenditure which had been incurred without a sanctioned estimate or appropriation. If the allotment for a new work were exceeded the actual excess over allotment would not be objected to, but the entire expenditure on the work. The reason for this was that the accounts office received no intimation as to the grant actually allotted. The term "appropriation" signified that a specified sum of money had been set apart by competent authority for expenditure on a definite object. As an illustration he referred to the recent Dacca University building on which expenditure had been incurred without an allotment, or appropriation, and the whole expenditure had been placed under audit objection. The reasons for the continuance of a work might be excellent, but the accounts office were obliged, in such cases, to place expenditure under objection until it was regularized. He was not sure whether, if a sanctioned estimate for a work* was as much as half a crore of rupees and this was exceeded by Rs. 100, the entire expenditure would be objected to in audit.

2,067. With reference to the head "objectionable for want of sanctioned estimates" he agreed that as a general rule it was not permissible to start such works without a sanctioned estimate but added that sometimes such a course was unavoidable, e.g., in the case of a large project, estimates could not be sanctioned in sections, but had to be grouped together; the preparation of all the estimates for such a project occupied a great deal of time and hence there would be undue retardation of work if sanction to the whole project had to be awaited. He did not think an accounts objection accelerated the obtaining of sanction, without due consideration of the estimates, as estimates were generally carefully drawn

* Mr. Tomkins afterwards wrote, in a letter dated the 23rd February 1917, that from a reference to the records he had learnt there were no actual cases of fraud in 1915-16 which involved loss of money to government.

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Mr. H. G. TOMKINS.

[Continued.]

up. He was against the accumulation in offices of estimates which there was no prospect of commencing in the near future as there was a probability that the rates and scales of accommodation provided therein might require modification with the flux of time thus necessitating the revision of the estimates. Rates only came under objection when they were likely to involve a substantial increased cost to government.

2,068. (*Rai Bahadur Ganga Ram.*) The compilation and audit of the divisional accounts were both carried out in the central accounts office by the one accountant, and the books in the audit office were so devised that practically the two processes were simultaneous. The compilation of divisional accounts at the head office ought to have reduced the charges for accounts establishment in the divisional offices.

2,069. The chief duties of the divisional accountant were to safeguard the Executive Engineer in making payments and in his dealings with contractors and to attend generally to the accounts proper of the division. It was essential that an Executive Engineer should have a competent and well-paid man as his accountant, in order to maintain an efficient record of his accounts and thus obviate possible losses to government arising from fraud committed by contractors, the negligence of individuals, etc.

2,070. In his opinion his scheme would lead to a saving in the lower grades of the divisional accounts establishment.

2,071. Whenever part payments were made measurements had to be recorded on the bills, but it was a question whether a reliable Executive Engineer might not be allowed to pay, say, one-third of the amount due for a building of which he had seen half erected before measurements were taken owing to the time involved in taking the measurements. The Accounts Department would certainly accept such a concession if the Code rules permitted it, as the duties of audit in such matters were governed by the departmental rules. It was not the present practice for Executive Engineers to take measurements themselves, and this duty was assigned to sub-overseers and overseers. He stated in this connection that he knew of cases where travelling allowance bills had been submitted by certain sub-overseers for journeys alleged to have been performed for the purpose of measuring up works at particular places, and investigation had proved that they could not actually have undertaken the journeys.

2,072. The schedule of rates was examined during the annual inspection with the view to ascertain whether it had been properly maintained. In his opinion it was easy for an audit officer to judge of this from the works abstracts and tenders filed in the divisional office.

2,073. There was no letter of credit for Executive Engineers in Bengal and those officers signed cheques, presented them for encashment at treasuries and then paid the contractors. The Executive Engineer was given unlimited credit and trusted implicitly.

2,074. (*Mr. Green.*) Personally he would have no objection to advancing to a contractor the amount spent in purchasing coal, if the latter was employed on the construction of a small building in the *mofussil* for which he had to burn the necessary bricks and had actually incurred the expenditure, but he added that such a pay-

ment would be an advance within the meaning of the Code rules prohibiting such advances, which only permitted of payments for actual work done. Hence the sanction of the Government of India would have to be obtained for such a payment.

2,075. The Executive Engineer was ultimately responsible for all accounts in the divisional office whether he signed his name or not to forms of accounts submitted to the accounts office. By "ultimately responsible," he did not mean to imply that the Executive Engineer would be held pecuniarily responsible for losses but that that officer was responsible for the work in the divisional office in the same way as he himself as Accountant-General was responsible for the work in his own office.

2,076. The divisional accountant might be regarded as an assistant to the Executive Engineer and his adviser in matters relating to accounts procedure, but he ought not to be made responsible for the accounts.

2,077. There was no multiplicity of audit objections as each objection was raised once and for all and was not entered in the monthly list as a new item. The actual figures for objectionable items were indeed startling, but as he had already explained they related chiefly to excesses over appropriations and outlay incurred without allotments. The Dacca University buildings were included in the aggregate of the objectionable items in the year 1915-16, and accounted for Rs. 7,50,000. At the stage when the estimate for that work had not received sanction the whole of the expenditure on it was placed under objection. This he admitted did swell the total, and two or three similar large works made a vast difference. The percentage of the objectionable items expenditure as shown in the Appropriation Report for 1915-16 was 44.4 per cent., and the year previous the percentage amounted to 34.4. The difference between the two figures was due entirely to the fact that two large projects were under construction in the former year. His conclusion therefore was that large works increased the percentage by 6, 7 and sometimes 8 per cent. The figures for objectionable items did not indicate that the Executive Engineer, or the Public Works Department, were guilty in any way of grave irregularities, but merely showed that works were in progress for which sanction had not been received and for which sanction was to be looked for, though there might be departmental reasons why they had been commenced prior to the receipt of such sanction. The Audit Department was not satisfied with partial sanctions, e.g., a sanction to the construction of the foundations and plinth of a building only, and required sanctions for complete projects. There was no necessity for convening a committee composed of the Accountant-General and certain executive and administrative officers of the Public Works Department to consider which objections could be removed as 99 per cent. of them were based on administrative rules of the Department. The witness here referred to the second clause of paragraph 275 of the Public Works Department Code which was a typical instance of the class of objection he referred to. In that rule Executive Engineers were enjoined "invariably" to submit the "works slip," and the use of that word precluded the Accounts Department from exercising any discretion in the matter.

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MR. J. M. LACEY.

[Continued.]

At Madras, Friday, 16th February 1917.

PRESENT :

F. G. SLY, Esq., C.S.J., I.C.S. (*President*).SIR NOEL KERSHAW, K.C.B. (*Present for first witness only*).

C. S. COBB, Esq., M.V.O.

A. T. MACKENZIE, Esq.

And the following Co-opted Member :—

W. J. J. HOWLEY, Esq., A.M.I.C.E., Superintending Engineer, Public Works Department.

D. G. HARRIS, Esq. (*Secretary*).

J. M. LACEY, Esq., A.M.I.C.E., Superintending Engineer, Public Works Department.

Written Statement.

2,078. (I.) Economy and suitability of methods of execution of public works, and (II.) Encouragement of other agency.—Except for the two Chief Engineers and their offices, there is no separate “Buildings and Roads Branch” and “Irrigation Branch” in the Public Works Department of the Madras Presidency. All works, i.e., irrigation and civil buildings, in a Public Works Department division are carried out by the Executive Engineer in charge of that division, even in the large deltaic irrigation divisions, so that except in the case of the presidency divisions, which will be dealt with later on, no economy is likely to result by the civil works in a *mofussil* Public Works Department division being carried out by agency other than the Department. The maps* of the two districts Chingleput and Nellore in the 5th Circle of superintendence, which I have submitted to the Chief Engineer, show the scattered nature of these civil works and their proximity to irrigation works in charge of the Executive Engineers of those divisions.

(2). Apart from the above fact, there are no skilled contractors to whom these works could be entrusted entirely. It would not pay any large contracting firm to take them up. The so-called contractors whom we employ, owing to the limited staff of a division, are local men, who by being able to supply materials and labour, the latter by advances in money or grain, are able to get some return for their capital expended: often the reverse. They are, as one Executive Engineer states, generally optimistic regarding increase in rates. All setting out, supervision (skilled and petty) and the preparation of bills is carried out by the Public Works Department.

(3). The Public Works Department staff in a *mofussil* division is generally under-manned. There is much to be done, particularly in the investigation of possible supplies from surface and ground water and the further development of irrigation and water supplies, to bring the country in line with what is being done in other arid countries. It is only a government can undertake such works. No private agency can afford such investigations without prospect of some return. The backbone of India and its people is agriculture. It is possible that the proximity of the presidency towns obscure the view of district conditions so that a certain amount of credence is given to irresponsible persons, journalists and else, who write on conditions in India, development of industries and so forth. The districts depend on agriculture and the mass of the population have no idea of co-operation or self-government; they budget their income in pice and they have no labour unions. This being so, the prosperity of such a country must depend largely on the efficiency of its irrigation works and the condition of its communications. It seems, therefore, common sense to place all such works under a trained organized department, instead of allowing a portion of such works to be controlled by amateurs. Assuming the definition of a civil engineer to be that given in the Charter of the Institute of Civil Engineers, the most useful man in a district is the Executive or civil engineer. With regard to the district boards relieving the Department of civil works, an engineer writing on the reorganization of the engineer-

ing department of a municipal corporation describes the procedure adopted by that body as “Gilbert and Sullivan engineering”; this remark may be aptly applied to procedure, rules, and restrictions laid down by some district boards to control their engineering establishment. No good or loyal work can be expected from such rules, and I am confident that better results will be obtained and greater efficiency secured by placing all roads and minor irrigation works in the charge of the Executive Engineer in whose division they lie. The district board staff and minor irrigation staff would merge into the Public Works Department.

(4). Turning to the presidency town, there are two Public Works divisions and one electrical sub-division which are employed entirely on civil buildings. The expenditure a year in both divisions is about Rs. 12 lakhs against Rs. 30 to Rs. 40 lakhs in the *mofussil*. There are no “general contractors” to whom the construction of a whole “work” could be given. There are firms with trained men for a particular class of work, such as, drainage and sanitary fittings, installation of electric lights and fans, girder bridges and various patent floors and roof coverings. Their rates are high and must be so as the services of skilled assistants have to be paid for and the firms have to allow for their own profit and possible fluctuations in the price of labour and materials. An attempt was made some years ago to place a large work in the hands of a general contractor without success. A general contractor would be welcome if we could get one, but I doubt if any great reduction in the supervising staff of the Department could thereby be obtained. Under the Public Works Department Code, Volume I, Chapter VIII, paragraph 773, the engineer is still responsible for the manner and time in which a work is done. A “general contracting” firm could not carry out works at our schedule of rates. The so-called building contractors whom we employ, owing to lack of establishment, are similar to those employed in the *mofussil* with perhaps in some cases a little more skill. There is this difference, however, that the chief building materials in the city are supplied by government, i.e., stock bricks, lime, and structural steel as the “contractors” are not able to supply them of the quality and at the cost that government can manufacture or procure them. In all cases the works have to be set out, supervised (both skilled and petty) and billed for by the Department. Three large works are, under orders of the Chief Engineer, being carried out departmentally with a reduction in our schedule of rates and with a knowledge that good work is being put in. There is also the consideration that alteration and modifications often found necessary in working out a large building scheme do not involve government in possible liabilities as would be the case if the work was being done by contract. Personally, I consider that there is no better or more efficient method of carrying out work than the departmental system of the Public Works Department, if rules are strictly observed.

2,079. (III.) Changes in organization.—With reference to any proposed change or modifications in the organization of the Department, the time given to me is too small to pass any definite opinion on so large a question. I may say, however, that men must be recruited young and “grown up” in the Department if

* Not printed.

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[Continued.]

one may use such a phrase. It is only thus that an *esprit de corps* can be obtained. I am not in favour of recruitment being made from private practitioners or engineers from local firms. The former will give you men who will give loyal work to the Department, irrespective of whether they have to spend years in isolated places or in unhealthy districts, knowing that their prospects are secure. The latter may lead to job hunting.

(2). Regarding the subordinates in the Department, so far as this presidency is concerned the class of men employed are equal in social standing and in general education to the similar class in any other government department. The majority of them are capable practical men, good organizers and are the backbone of the Department. A good subordinate is a very valuable man. Something should be done to increase their prospects and I would fix for limits the salaries; upper subordinates from Rs. 100 to Rs. 700, and lower subordinates from Rs. 50 to Rs. 150. It pays to get good men. Also, I would suggest that when a man enters the subordinate service he starts at the lowest grade and his future promotion should depend on his work and not on the examinations he has passed.

2,080. (IV.) Relations with other departments and sub-branches.—The question whether the Department meets the requirements of other departments can best be answered by members of the other government services. I do not think there are any serious causes for complaints. Sometimes there are delays due to the necessity of obtaining sanction for a work or funds. With a view to keeping government informed of the progress in the preparation of estimates for civil works which have been administratively approved an arrears list is submitted periodically by the Superintending Engineer to the Chief Engineer. There are certain officers who constantly require alterations and changes made in a work during its construction, forgetting that the designs are approved by the administrative heads of their departments and that such changes cannot be carried out without formal sanction by competent authority.

Regarding the relation *inter se* of the various sections of the Buildings and Roads Branch:—

(a). Electrical works are comparatively very small and are confined chiefly to the installation of lights and fans in buildings in the city of Madras, and there is not likely to be very great development for years. Such works being connected with buildings should be under the charge of the Executive Engineer of the division in which they may be. At present the electrical works in the city are under a sub-divisional officer working directly under the Superintending Engineer. This is a temporary arrangement owing to present conditions. I consider that each Executive Engineer of the Presidency Division should have a sub-divisional officer for the charge of electrical work in his division, so as to make the chain of responsibility complete both in regard to works and accounts, so as to be in accordance with the spirit of G. O. No. 851W. of the 14th August 1909. I have no wish to cast any reflection on the work of the present "Electric" sub-division. The sub-divisional officers who hold, and held charge of it during the two years I have been in Madras have rendered able and willing service in the difficult and trying conditions they have to work in. The work in the city in being carried out by firms with trained men, and no difficulty has been experienced in getting work done.

(b). Architectural works are small compared with the total work of the Department and are confined chiefly to large buildings in the city. Type designs for residences, offices, *taluk katcheries*, police quarters, etc., are drawn up in the Consulting Architect's office. The construction should be carried out by the Executive Engineer in charge of the division in which the work lies. The Consulting Architect is not generally acquainted with local conditions and an architect is not an engineer.

(c). Regarding sanitary engineering, this is a very important branch of the Public Works Department and should increase in importance. The time has come for a more efficient despatch of business and I consider that

there should be a Chief Engineer for sanitary works with similar powers to that possessed by the Chief Engineers, Buildings and Roads and Irrigation. I would not dissociate it from the Public Works Department. The Chief Engineer for sanitary works would be responsible for the drawing up and designing of sanitary works, and the execution would still be carried out by the Executive Engineer in whose division the work lies, or if the work is of any magnitude a separate division should be formed. Such works would be under the control of the Superintending Engineer in whose circle they lie, and they would be directly administered by the Chief Engineer for sanitary works.

(d). The sanitary works are chiefly concerned with the drainage and water-supply of *mofussil* municipalities. It would be quite possible for these municipalities to carry out their own schemes, but they are either unable or unwilling to pay for an engineer competent to carry out and supervise their works. Moreover, funds for such works, *i.e.*, water-supply and drainage are granted or advanced by government, and the Executive Engineer with a knowledge of local conditions would probably be better able to construct such works than a so-called expert with no local knowledge.

(e). Besides the above-mentioned works, the Chief Sanitary Engineer would be responsible for engineering operations against malaria, a very vital question, and other works for the general improvement of the sanitary conditions of the presidency; works which can only be undertaken by government. It is not possible with the limited time at my disposal to go into further detail on this point. Large and important works—no matter of what branch—would be considered by a full board of the three Chief Engineers.

2,081. (V.) Decentralization.—I do not see what further decentralization is possible. It would be absurd for several executive officers, independent of each other, to be working in the same area. There is not enough work for so many and interests are sure to clash.

2,082. (VI.) Simplification of procedure.—If the spirit of the principles set forth in the Public Works Department Code, Volume II, paragraphs 1922 to 1924, regarding the sanction of works, and paragraphs 781-783 regarding execution, and paragraphs 1,125, 1,126 and 1,127 regarding accounts are kept in view by executive and audit officers there should be no undue restrictions in getting work done. An Executive Engineer may be given certain powers to increase his responsibility and to avoid petty references to higher authorities. The following minor points are brought to notice: Code, paragraphs 321, 322. The powers of sanction to original works as laid down therein have been curtailed by the interpretation that those powers are only for technical sanction and the Executive Engineer has thus no powers of administrative sanction for original works. He should be allowed the powers of administrative sanction to the amounts stated in the Code.

Paragraph 757.—An Executive Engineer should be allowed increased limits in accepting contracts. I would fix these limits from Rs. 30,000 to Rs. 10,000.

Paragraph 908, as amended, empowers the local Government to delegate their powers for the sale or dismantling of permanent public buildings to Executive Engineers. In the case of temporary buildings their sale or dismantling can only be sanctioned by the Superintending Engineer. This paragraph should not apply to work-sheds, and I understand that the temporary buildings mentioned in the Code refer to temporary offices, residences, etc., built during the construction of a project work and which will not be required when the project works are completed. If the monetary limits of an Executive Engineer are fixed so as to allow him—

(1) to incur expenditure solely on his own responsibility for original works—(2) to sanction dismantling and sale of buildings, sheds, stock, unserviceable materials, etc., up to certain limits—(3) to enter into agreements and contracts up to certain limits without reference to a higher authority—a good deal of unnecessary, useless and hair-splitting audit objections would disappear. There is a good deal of purposeless challenging of items

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in the accounts of Executive Engineers on purely technical grounds which have no real value and are vexatious.

Advances should not be made to contractors except in very special cases. If a contractor undertakes a work presumably he has funds to carry it out.

2,083. (VII.) Education and (VIII.) Practical training.—The education given in the College of Engineering, Madras, is sufficiently advanced for civil engineers for government appointment. A good deal depends whether a man, after he has completed his theoretical training, has any aptitude for his profession, or is only an arm-chair theorist. He will have to be inured to hard out-door work and to be capable of handling subordinates and labour if he hopes for any success in his profession. To quote the words of a president of the Institution of Civil Engineers “nothing can take the place of experience and actual contact with difficulties.”

MR. J. M. LACEY called and examined.

2,084. (President.) The witness stated that he was a Superintending Engineer of 26 years' service, all of which had been spent in the Madras Presidency.

2,085. There were no distinct Irrigation and Buildings and Roads Branches in Madras but each had a Chief Engineer. The question whether irrigation works in the presidency were generally scattered, or in compact areas, was rather difficult to decide. They were closely situated in the northern deltaic districts, but tanks in other parts of the presidency were scattered. Except for the Stores Division and two buildings and roads divisions in Madras itself, there were no divisions situated outside the irrigation area and these latter divisions were entrusted with a large amount of irrigation work. A division had been formed within the past two years mainly for buildings and roads work, but he was not sure whether it had any irrigation works.

2,086. In addition to the irrigation major works there were minor irrigation works under the charge of the Collector who was given a supervisor and sub-overseer for their supervision, the estimates for the works being scrutinised by the Executive Engineer. He did not know why these works had been entrusted to the Revenue Department, but presumed it was chiefly on account of their insignificance. As a general rule, only tanks which were less than 200 acres in extent were handed over to the Civil Department, but this did not apply to railway-affected tanks. The tanks so made over were scattered and were sometimes to be found in the same neighbourhood as the larger irrigation tanks; very often they were also connected with the same group. He was not in favour of the system and was of opinion that an Executive Engineer was able to supervise minor irrigation works also.

2,087. There were certain roads in the presidency which were under the control of the Public Works Department but he could not specify their names. There were no roads in his circle. As he was not directly concerned with roads, he was not aware of the principles which governed their transfer to district boards. He was also not aware as to the mileage of roads under the Public Works Department and district boards, respectively.

2,088. All state buildings were under the control of government and he was not aware of the principles which regulated the transfer of minor government buildings, to district boards. All government buildings, including those of the Police Department were in charge of the Public Works Department, and none of the civil departments except the Forest Department either constructed or maintained its own buildings.

2,089. He was emphatically opposed to the proposal that purely buildings and roads divisions should be placed under the executive control of Architects. In his opinion the main duties of an architect were to design buildings and to attend to their symmetry, while construction was essentially a matter for the engineer. He differed from the view that an architect could be held responsible for technical engineering details as well, as

(2). With regard to practical training, I do not know why the one year's practical training in the workshops is now omitted. This is essential for both engineer and subordinate students, whether mechanical or civil engineers. It is true that, for efficiency in mechanical engineering, several years should be spent in a workshop, but the year spent by the civil engineering students would be invaluable to them in after-life. They should be made to do actual work in the several branches of the shops, so as to gain an idea of what constitutes bad and what good work and the value of work for money spent. College workshops are toy-shops. The second year of a civil engineer student should as now be spent on large works. The training received in this year depends on where the student is sent. Young Assistant Engineers on arrival from England are now put in charge of light overseer sections so as to gain a knowledge of the rudiments of their work.

an architect, to his mind, was an artist and not a builder. Besides Public Works Department officers with their experience of local rates and conditions were in a far better position to supervise construction than an architect. Under the present procedure the Consulting Architect was purely an advisory officer and had no authority over construction. He occasionally inspected buildings during their construction, and supplied engineers with all the necessary details. Hence the engineer was responsible for the structural stability of buildings designed by the architect, and not the architect. He could not, by reason of his limited experience in Madras city, express an opinion on the question whether the Consulting Architect should be placed in charge of a separate architectural sub-division, but remarked that it had already been discussed by a late Chief Engineer. He added that the construction of all buildings in Madras was originally carried out under the supervision of the Consulting Architect, but the practice was abandoned as it had been decided that the Consulting Architect was really more an advisory than an executive officer.

2,090. District boards carried out their own works with the aid of an engineering staff employed for the purpose. Estimates in excess of a certain sum were submitted to the Superintending Engineer for scrutiny, and those over another amount were likewise submitted to the Chief Engineer. The Public Works Department had no connection with the actual construction of district board works, but the Superintending Engineer was required to submit a report to the president of the board on the work of the district engineer. This he did as a result of his annual inspection of the district board engineer's office when he reported generally on the efficiency of the staff and the work of the district engineer. The Superintending Engineer was not concerned with the appointment of district engineers, but the Chief Engineer probably advised in the matter. Neither the Superintending nor the Executive Engineer possessed power in regard to district board works such as that exercised in England by an Inspector of Works. The Superintending Engineer did not inspect works in progress under the district board, nor did he report on the state of such works.

2,091. The Public Works Department was not concerned with municipal works, except those which related to drainage and water-supply, and these were constructed by the Department as none of the municipalities, except the Madras Municipality, had an efficient staff for the purpose. Estimates for municipal works were not submitted to the Superintending Engineer for approval, as in the case of district board works, but the estimates for sanitary works were submitted to the Sanitary Engineer.

2,092. He advocated that all minor irrigation and district board works should be transferred to the Public Works Department in order to effect centralization and to obviate duplication of staff, and he considered that the arrangement would lead to economy and greater efficiency inasmuch as it would admit of the same establishment

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attending to large and small works simultaneously, and avoid the necessity for the employment of two separate establishments for these two classes of work in cases where a large work as well as a small one were both in hand. The divisional establishments, he added, would naturally have to be augmented, but his proposal would do away with the necessity of having three sets of men working within the same area. In his opinion the Public Works Department and district board rates were practically on a par, and the former were certainly not higher. He had not compared the cost of the Public Works Department and district board establishments but believed that a slight increase in the divisional staff would be found necessary if district board work was taken over by the Department. He could not say whether the percentage for establishment was higher in the Public Works Department than in the case of district boards as he had not examined the question. He added that he had not examined his proposal from a political, but from a departmental point of view.

2,093. He did not consider that the 25 per cent. rate for establishment was excessive in view of the fact that it included both direction and construction establishment, and included charges for the scrutiny of district board estimates, whereas in the case of district boards only construction establishment was allowed for. The Madras percentage was higher than that of other provinces, where it was 15 per cent., as it included irrigation establishment, who were employed on irrigation major works and the distribution of water. On interrogation he admitted, however, that a large portion of the staff was not engaged on the distribution of water, and that accordingly the percentage was not materially affected thereby; in fact that he could not account for the low rate of 15 per cent.

2,094. The expenditure in the executive divisions in the presidency varied. In the year 1915-16 the expenditure in the north presidency was Rs. 9,82,000 whereas it amounted to Rs. 5,00,000 only in the south. In Chingleput, on the other hand, it amounted to Rs. 2,40,000 for irrigation, and Rs. 75,000 for buildings, and in Nellore Rs. 1,78,000 for irrigation, and Rs. 66,000 for buildings.

2,095. Works in Madras city were usually constructed by petty-contract, subject to departmental supervision, as large building contractors were not available. The supply of materials, e.g., structural steel and table-moulded bricks, was retained in the hands of government, and there was a clause to this effect in the agreement, as the contractors were merely suppliers of labour. Recently some large buildings had been erected departmentally as they were of a complicated nature.

2,096. He had effected a comparison between the rates for government and private bricks and found the former varied between Rs. 10-14-0 to Rs. 12 per thousand, as compared with Rs. 14-15-0 the private rate. As far as he was aware all charges were debited to both accounts, but private manufacturers were obliged to take into account additional items such as land, and allowances for profit and fluctuations of prices, and this tended to increase the private rate. The bricks manufactured by government were table-moulded and those available in the open market were ordinary, and the latter were possibly more freely used. He was only aware of one firm of brick manufacturers in Madras, but he stated that there might be more.

2,097. Structural steel was obtained by direct indent on the Secretary of State as the supply from this source was found to be cheaper and better. The conditions at present were exceptional, but he could produce figures in support of his assertion. None of the firms in Madras manufactured structural steel and it had been his experience that he had always been obliged to pay at a higher rate when he had run short of requirements and had purchased steel in the open market. He admitted, however, that if the ordinary requirements of the Department were supplied by firms, that the rates would possibly be reduced, but even then they would be subject to great fluctuation. No contractors were available who could be trusted to supply materials up to specification, and as a proof of this he mentioned that government would not

have started their own brickfield if they had been able to obtain the class of brick they required. He added that, as a matter of fact, government had to manufacture their own bricks even in the *mofussil* because of the dearth of a supply of good bricks.

2,098. The Stores Division stocked girders, iron plates, structural steel, nuts, screws etc., for departmental requirements. There was a separate Workshop division and the accounts were audited by the Accountant-General.

2,099. He had never effected a comparison between the Public Works Department and private rates, but had compared the former with those of municipalities and found that the latter were higher. He thought that the Port Trust rates were similar to those of the Public Works Department but could not say so with certainty. Railway rates were probably a bit higher, and he was under the impression that private rates also were not cheaper than Public Works Department rates. In one case he had, however, examined the rates for the construction of a private dwelling and found that there was not much difference in the rates. He admitted that he had not taken into consideration the cost of supervision in such examination and stated that it would not have made any difference in the particular case he had referred to as the construction of the building was supervised by a person other than the contractor.

2,100. Work executed by petty-contract was set out, and levelled by the Department, and the amount of departmental supervision varied according to the size and importance of the work. As a rule a *mistri*, whose pay was charged to works, remained at the site of each work to see that it was properly carried out and his work was supervised by a sub-overseer or overseer, also by the sub-divisional officer, Executive Engineer and Superintending Engineer. The employment on a work of whole-time subordinates and the frequency of inspections by the superior officers of the Department, however, hinged entirely on the location and magnitude of the work.

2,101. The Electric Inspector was purely an advisory officer and electrical work was executed by a temporary sub-division directly under the orders of the Superintending Engineer. In his opinion each Executive Engineer should have an electrical sub-division under his control and be made responsible for both the buildings and the electrical fittings in them. He did not approve of the Bengal and Bombay systems under which the Electric Inspector was directly responsible for electrical installations and the fittings in buildings. He added that as the Electric Inspector in Madras administered the Indian Electricity Act, he could not be placed in independent charge in view of the fact that he might be called upon to arbitrate in cases of dispute. There were no government power houses in Madras, and the only work done at present was the installation of lights and fans in government buildings. He was averse to the formation of an electrical division as the annual expenditure was only Rs. 60,000 to Rs. 70,000. He considered, however, that as the electrical work increased electrical sub-divisions might, as he had suggested, be formed and made subordinate to Executive Engineers.

2,102. The work undertaken by electrical firms in Madras had been done satisfactorily, but he did not know why they had succeeded where building contractors had failed. It might be due to the greater demand for electricity owing to its being a new industry, and this doubtless was the reason why electrical firms could afford to employ trained electricians. He added that if government executed electrical work departmentally it would prove more economical.

2,103. The Sanitary Engineer designed water-works and drainage projects, the construction of which was carried out by the Executive Engineers of divisions, unless the work was of sufficient importance to justify the creation of a special sub-division. The few works he had supervised were given out on regular contracts, the pumping plant only being obtained from the India Office and erected by the agents of the supplying firms. He added that pipe laying had been done departmentally on one or two occasions.

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2,104. As there were no sanitary engineering firms in Madras which were capable of undertaking a large sanitary scheme, the Calcutta system of giving out such work to contracting firms, under the supervision of the Sanitary Engineer, could not be followed in Madras.

2,105. He advocated the creation of a separate Sanitary Branch subordinate to the Chief Engineer and that the construction of sanitary works might, as at present, be undertaken by Executive Engineers subject to inspections by the Chief and Sanitary Engineers. In his opinion the time had arrived for bringing the Sanitary Branch into line with the Buildings and Roads and Irrigation Branches, but he did not approve of the execution of sanitary work by a staff working under the direct orders of the Sanitary Engineer as he anticipated that it would lead to friction between the sanitary and executive staffs owing to their working in the same area. He added that Executive Engineers had greater experience of local conditions and that the special knowledge possessed by a Sanitary Engineer was confined to designs, the work of construction being essentially an engineering matter.

2,106. A Superintending Engineer's powers of administrative sanction were Rs. 2,500, and his powers of technical sanction Rs. 50,000. In his opinion these were quite adequate. He did not think any advantage would be gained by increasing a Superintending Engineer's powers of administrative sanction, but if it was intended to increase them he proposed that they might be raised to Rs. 5,000. The preparation of plans and estimates for works costing less than Rs. 50,000 rested with Superintending Engineers, but for sums in excess of that amount was open to the Chief Engineer either to prepare plans and estimates in his office or to instruct Superintending Engineers to do so. As a matter of fact, all large works were dealt with in the Chief Engineer's office, and were designed by the Consulting Architect. A Superintending Engineer's powers of sanction in the matter of repairs were limited only by the budget allotment.

2,107. Executive Engineers possessed no powers of administrative sanction, but he recommended that they should be empowered to accord administrative sanction to estimates for original works amounting to Rs. 200, or Rs. 500 and Rs. 1,000 in the case of selected officers. An Executive Engineer's powers of technical sanction were limited to Rs. 2,500 and he proposed that this limit should be increased to Rs. 10,000 in the case of senior officers, and to Rs. 5,000 in the case of junior officers.

2,108. Executive Engineers were empowered to appoint and dismiss temporary clerks subject to the approval of the Superintending Engineer, and they had full powers over the menial and works establishments. Superintending Engineers likewise had full powers in regard to clerks and sub-overseers, and he was not in favour of a delegation of these powers to Executive Engineers, as such men were liable to transfer. The objection to the delegation was that it would empower a particular Executive Engineer to find fault with a man who had done really good work under another Executive Engineer and dismiss him without his obtaining any redress. A similar objection would apply in the matter of the delegation to Superintending Engineers of the power to dismiss upper subordinates. In his opinion the fact that a man's record would go with him and be a guide to the officer passing final orders would not be a sufficient safeguard against the abuse of the power.

2,109. Detailed estimates were framed for annual repairs to all government buildings and there were standard measurements for certain of the items, e.g., white-washing, colour-washing, etc., As he had not studied the question, he preferred not to express an opinion on the proposal that their preparation be abolished and repair expenditure regulated by percentage allotments calculated with reference to the capital value of buildings.

2,110. He did not think that the accounts work of an Executive Engineer absorbed an undue amount of time but the literal interpretation of rules by audit officers often led to a deal of unnecessary work. The compilation of the monthly accounts was done in divisional offices and he considered this necessary.

2,111. The majority of audit objections were minor and unnecessary. For instance he knew of a case in which a rate slightly higher than that shown in the schedule of rates was paid for turfing, and it was objected to by the Accountant-General, though the sum involved was Rs. 20 only. In his opinion questions connected with rates were essentially of an executive nature and wholly outside the province of the audit officer.

2,112. He was opposed to the grant of advances to contractors, and was of opinion that only contractors with capital should be encouraged, and explained that if a contractor borrowed money his rates would necessarily include both his profit and the interest payable on the loan and thus be higher. He was more inclined to the view that only men with capital should be selected for the execution of work, even if their tenders were more than those of men without capital, as the rates of the latter would necessarily be such that it was impossible for them to execute the works at the rates quoted.

2,113. The class of upper subordinates trained at the Madras Engineering College was satisfactory and met the needs of the Department, and the training accorded to them was not higher than was really necessary as some of the men eventually received promotion in the Department. It was true that some of the upper subordinates were recruited from students who had passed the engineering course and that it was not necessary that upper subordinates should have as high a standard of education as engineers, but the practice of recruiting engineers who had failed to secure guaranteed appointments as upper subordinates had its advantages as well as disadvantages. The entire upper subordinate establishment was not recruited in this way, but only a portion of it.

2,114. He could not say on the spur of the moment whether there were any upper subordinates in his circle who were considered unfit to hold sub-divisional charge, but it was his general experience that there were a number of upper subordinates in the Department who had been passed over merely because they were unable to control men.

2,115. He could not pronounce a definite opinion on the work of lower subordinates as a whole, and he had had both good and bad men of that class. Lower subordinates were recruited from students who had passed the lower subordinate test in the engineering college and occasionally from *mistris* who had been trained in technical schools. Three or four *mistris* had been so appointed during the past five years. He was unable to express an opinion on the suggestion that a certain proportion of lower subordinates instead of being wholly recruited from colleges might be recruited from men who knew surveying and estimating, and that the balance might be recruited from the *mistri* class who would be placed in immediate charge of works. He remarked, however, that the initial pay of a lower subordinate in Madras was the same as that of a really good *mistri*, and that no serious difficulty had been experienced under present conditions on account of the lack of practical knowledge in sub-overseers. On the whole, he was inclined to the view that there was really no necessity for the proposed change.

2,116. (*Sir Noel Kershaw.*) With reference to the statement in his written memorandum that there was no better or more efficient method of carrying out works than the departmental system of the Public Works Department, if the rules were strictly observed, he explained that this remark had general application and did not refer only to buildings. His experience had been that all work could be executed more satisfactorily and economically through departmental agency, than by contract. He admitted, however, that he had considered the question purely from the engineering point of view and not from a political standpoint. He had not seen the report of the Public Services Commission, but considered that they had viewed the question chiefly with a view to the encouragement of private enterprise. He had not looked at the question in this light also, as his duty as an engineer was to get work done for government in the most efficient and economical manner.

2,117. He was not aware of the proportion of private to government work in Madras, but presumed that the

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latter was possibly somewhat greater; and did not think that the monopoly the Public Works Department had of government work affected the execution of private works in any way.

2,118. The energy for electrical installations in government buildings was supplied by the Madras Electric Supply Corporation, who did not contract with private consumers for the repair of their installations as well as the supply of electricity.

2,119. With reference to the remarks in his written statement on the responsibility of architects for the construction of buildings, he explained that he was not aware whether, in Europe, an architect was held responsible for the structural stability of the buildings he designed, but that he believed that the architect was originally a designer and not a builder. His comments did not have reference to any particular case, but to the desirability generally of retaining construction in the hands of an engineer, who by his training and experience of local conditions was in a better position to supervise the erection of buildings. As a matter of fact the whole question had already been considered in Madras where the construction of buildings was formerly carried out by the Consulting Architect. The system had, however, been found defective, and as a result the Architect was now merely an advisory officer.

2,120. With reference to the difference in the cost of the Public Works Department and district board establishments, he repeated that this was due to the inclusion by the latter of construction establishment only. His whole point was that the Public Works Department rate was as high as it was because of the fact that the advice they gave to local bodies and other departments was not taken into consideration in the calculation, and that if it was the percentage would be appreciably reduced.

2,121. He was not of opinion that there was too much supervision by the Department in the matter of district board works. The Department only executed such important work on their behalf as the president of the board desired them to take up. The limit in excess of which estimates had to be submitted to the Public Works Department for approval had been fixed for purposes of government control, and he was not aware when the rule had been framed.

2,122. (*Mr. Mackenzie.*) From an engineering point of view the execution of district board works by the Department would lead to greater efficiency and economy, but he could not say whether such a practice was expedient politically.

2,123. He was not aware whether the 5 per cent. levied for the revenue collected on irrigation works was set off against the expenditure on the Public Works Department establishment, but admitted that the control by the Public Works Department of roads in other provinces possibly influenced the percentage rate for establishment, inasmuch as no additional establishment was required for their upkeep whereas the expenditure on them tended to reduce the charges for supervision. Interest and direction charges were not debited to bricks and steel purchased from England which were kept in stock.

2,124. Under the rules articles could only be indented for when they were not procurable in India, and inquiries were always made as to the local rates of supply prior to the despatch of an indent. In cases where steel had been purchased locally it had been found uneconomical. The quality, however, was good.

2,125. No contractors to whom the construction of large buildings could be entrusted were available. One of the largest private buildings in Madras city had, however, been erected by a local contractor, the stone-work being done by a Bombay contractor.

2,126. An allowance of 12½ per cent. was made, in fixing rates, for contractors' profits.

2,127. He agreed that if engineers underwent a year's training in workshops it would be beneficial. He thought, however, that they should receive this training in regular workshops and not in those attached to colleges.

2,128. (*Mr. Cobb.*) He had recommended a training in regular workshops as he considered the students frittered away their time in the college workshops. The latter

might be regarded as useful for the purpose of imparting an elementary training, but were not adapted to give the higher training which was obtainable in regular workshops. He admitted that students were somewhat advanced in years by the time they had completed their college training and recommended that the standard for admission be lowered to either the intermediate or matriculation examination so as to ensure their admission at an earlier age and thus pave the way for a practical workshop training at the close of their theoretical course. In his opinion if both the theoretical and practical training were completed at the age of 25 it would be quite sufficient. He added that students who had passed the examinations he had mentioned had a sufficient knowledge of English to enable them to follow the instruction and lectures given in engineering colleges.

2,129. He considered it was essential that an architect should be assisted by an engineer in the construction of a building.

2,130. He did not agree with the argument that a business firm could purchase stores cheaper as they purchased articles when the market was most favourable whereas the Department effected purchases only when articles were needed and accordingly had to pay whatever price was demanded, as he considered the fact that the Department purchased stores in greater bulk enabled them to obtain them cheaper. The Stores Division in Madras stocked a considerable quantity of stores for departmental requirements, and the amount of the reserve limit was fixed by government.

2,131. He was very much opposed to the Audit Department questioning small differences in the scheduled rates and urged that the practice be discontinued. He was also not in favour of the suggestion that whenever there were differences in rates the reasons therefor might be explained on the bills before their transmission to the Audit Department, and mentioned that the reasons for large excesses were invariably explained in revised estimates and that a copy of the explanation was forwarded to the Accountant-General.

2,132. The inefficiency among subordinates was not so great as to justify an amendment of the rules regarding the punishment, dismissal, etc., of subordinates, nor was the procedure for obtaining sanction to the dismissal of a subordinate so elaborate as to deter an Executive Engineer from reporting an incompetent person. The fact that there had been cases where men had been dismissed from the Department in no way indicated that such cases were frequent. In his opinion if the charges against an offender were clearly and carefully drawn up there was no difficulty under the present rules in getting rid of inefficient men.

2,133. (*Mr. Howley.*) He had compared the district board and Public Works Department rates and found that they were practically equal. The Public Works Department standard of work was perhaps a little superior, but he could not definitely say so.

2,134. In his opinion, the supervision of roads required a smaller establishment than that required for the supervision of detached buildings, and this was one of the reasons why the establishment percentage in Madras was higher than that of other provinces which entrusted roads to the control of the Public Works Department. Another reason was the large number of projects, for which designs had been prepared, which never came to fruition and there had been many such within the past ten years. Even in the case of other works designs had frequently to be recast sometimes as many as three or four times and the departmental system was more advantageous in such cases, as under a regular contract the modifications would involve government in liabilities.

2,135. The proposal for the creation of a separate electrical division had been dropped as there was not enough work at present for a separate electrical staff. The expenditure for electrical works in his circle for the previous official year was Rs. 64,000.

2,136. Plans and estimates prepared by the Consulting Architect were scrutinised in the Chief Engineer's office and Executive Engineers were held responsible for the structural stability of the buildings they constructed.

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2,137. The delegation to Executive Engineers of powers of technical sanction up to Rs. 5,000 would not lead to increases in the divisional staffs as plans were chiefly prepared in the offices of Superintending Engineers.

2,138. The monthly accounts should not be rushed and nearly all the men in a divisional office impressed to complete the work if the accounts had not been neglected or allowed to fall into arrear during the month.

2,139. Sub-overseers were occasionally placed in charge of sections, and in such cases they practically performed the work of upper subordinates. He could not say definitely whether difficulty was experienced in promoting *mistris* to the lower subordinate and upper subordinate grades. Personally, he had secured exemption in these cases without any difficulty.

RAI SAHIB R. A. SRINIVASA AYYENGAR AVL., Executive Engineer, Public Works Department.

Written Statement.

2,140. (General.) The Public Works Department is the branch of government entrusted with the design and construction of roads, buildings, irrigation and sanitary works, water-supply and drainage of towns and other public works. In the Madras Presidency, a greater portion of the roads and smaller public buildings have been transferred to the local boards and municipalities, and the Public Works Department is chiefly concerned with the design and construction of all irrigation, sanitary, water-supply and drainage works and the buildings required for the various departments of government and only a very few roads are in its charge.

(2). The work of the Department is broadly divided into two branches (1) irrigation, dealing with matters relating to irrigation, and (2) general, or roads and buildings, dealing with those relating to all other kinds of public works and in some of the provinces such as the Punjab, and the United Provinces, the two branches work independently of each other and in others, such as Madras, the same officers look after the work of both the branches.

(3). The present inquiry relates only to the Buildings and Roads Branch and its scope is to find out how far the present method of work is economical and whether it is not possible to secure greater economy and efficiency by reorganizing the Department and substituting private for departmental agency. The Irrigation Branch is left out of the inquiry as its work is revenue producing and as such cannot be entrusted to private agency. In the provinces where the operation of the two branches are quite distinct, the substitution of private for departmental agency may perhaps tend to some economy and it has to be seen how far such a step will be economical in those provinces where the two branches are not separate.

2,141. (I.) Economy and suitability of methods of execution of public works.—So far as Madras is concerned, the work of the Department is mostly irrigation and occasionally there are a few buildings which are carried out by the same establishment. Except in the presidency towns and the headquarters of the newly-formed districts, no extensive building operations are carried out and as there are no roads worth the name, it may be said that the activities of the Department are confined to irrigation and no relief can be expected by the substitution of private for departmental agency.

(2). The inquiry has been started on the presumption that the present methods adopted by the Department in the execution of its works are not conducive to economy, that the works are very expensive and that there is waste of public money. It is also presumed that in the execution of works departmental agency is largely employed and that by substitution of private for departmental agency greater economy and better results can be secured. It is necessary, therefore, to describe in some detail the present system of execution of works in order to understand how far these presumptions are justified.

(3). There are three methods by which works are carried out, (1) departmental, (2) petty-contract and (3) contract. The first mentioned method consists in preparing or buying materials and employing labour on monthly or daily wages and carrying out the works under departmental supervision. The system when employed results in good substantial work at cheaper cost. But as constant supervision is required and the establishment is not sufficient to allow of this supervision, only a few works can be so carried out.

(4). The second method is to employ on each work a large number of petty contractors who are the heads of

gangs of workmen, and the third one is to employ large contractors who get the work done by petty contractors or by employing labourers on monthly or daily wages. Even these large contractors are, in no sense of the term, the large contractors as known on the continent of Europe where they are expected to have a large professional establishment in their employ who will prepare plans and estimates and supervise the execution of works, and all that the government or the employer has to do is to employ a suitable staff of technically qualified men who will inspect and pass the works. In India, the government at present occupies the position of these contractors and the professional agency employed by it takes the place of the establishment that has to be employed by them for the execution of works, and also the extra establishment required for the supervision and the passing of the works executed by them. By handing over the works to large contractors the establishment cannot appreciably be reduced, as it is still required for the supervision of works. When a large contractor undertakes a work, he pays for all the establishment employed by him and then charges the employer not only the cost of this establishment, but also a certain percentage on this for his advancing the money and for his personal labour. There are a good many attractions in government service such as leave, pension, etc., which make it possible for it to get the men required at a cheaper rate than the contractor and the actual cost that it will have to incur for the sake of establishment will, in case the works are given to large contractors, be considerably more than what it would have to pay otherwise and it cannot, at the same time, dispense with any of the establishment it has to employ for the supervision of the works. It has already been pointed out that the establishment maintained is just sufficient for the execution of works by contract and that none of it can be dispensed with if works are transferred to large contractors. The net result of such a transfer would be that the government will have to pay for the establishment twice and something more in addition for the contractor's labour.

(5). Further, these large contractors will utilize the local petty contractors by sub-letting the works to them and would naturally expect a large percentage as profit on what the works thus cost them actually. The government by directly dealing with these contractors is not paying the middlemen's profits now, and is consequently doing its works far cheaper than it would do had they been entrusted to large contractors. Thus on the score of economy and cheapness the present system is preferable to the one proposed to be introduced.

(6). Another point that has to be considered in this connection is that an impression has been created that the present Public Works Department establishment is more than what is required for the satisfactory execution of the works, and that a considerable reduction might be effected if the works were entrusted to large contractors as on the continent. This is an erroneous impression inasmuch as the works are not, at present, wholly carried out by departmental agency and the present establishment is just sufficient for carrying out the works on contract, and any change in the present system is not likely to be effective with any reduced establishment. The government has further to look after its irrigation sources and the establishment that is at present employed for the work of both the branches is just sufficient for the work of that branch alone, even if there were no buildings and roads to be looked after.

(7). Another point that we have to consider in this connection is that the state of things in India is not suffi-

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ciently advanced for it to be possible to entrust large works generally to Indian agencies. If the system is to be introduced at all, the large works will have to be entrusted to large contractors' firms having their headquarters outside India. Although such large firms may have strong financial backing large quantities of suitable plant and a trained staff, they cannot always be entirely satisfactory, as they have little experience of the class of labour that they have to employ, while their methods are strange to Indian labour and the supervising agency they can obtain in India. Under the present circumstances it is therefore not possible nor is it desirable to modify the existing system.

(8). The system of introducing non-Indian contractors has another serious disadvantage which also requires serious consideration. In a short time they will have established their position firmly in all the districts and, the Indian contractor being unable to compete with them, there will be every possibility of their forming a ring among themselves and raising the cost of the works. Such a development is very likely, as even in England, where public opinion is stronger, there have been such rings. In fact, whenever a few firms or individuals have the monopoly, there is every possibility of their combining together to make the best possible profits.

(9). There is yet another consideration. The field of work in India is so restricted that no firms whose operations are entirely confined to India would find it financially possible successfully to undertake the occasional work that might be obtained. Although some large firms may take up work at the presidency towns and the headquarters of the districts, they cannot take up works in the *mofussil* except at exorbitant rates, and their employment is consequently out of the question in those cases which are by far the most important.

(10). From the foregoing remarks, it will be seen that the methods at present adopted for the execution of civil works are economical and suitable for the purpose for which they were devised, and that under the present system private enterprise is sufficiently encouraged and that no change is, at present, desirable.

(11). There is one obstacle at present for the free encouragement of private enterprise, which is also the cause of delay complained of in various cases, and this is the restriction regarding the local purchase of certain articles. Under the present rules, even though a contractor may undertake to do the whole of a work on contract, he is precluded from buying and supplying certain materials locally unless he happens to be one of the firms approved by the Government of India. If he does not happen to be one of such firms the materials have to be bought by the officers, whose powers are restricted. The rules should be so modified that he may be allowed to buy the materials locally, so long as he gets them from one of the firms approved by government and the materials satisfy the current specifications and lists prescribed by the Government of India.

2,142. (II.) Encouragement of other agency, and (III.) Changes in organization.—The question whether it is possible or desirable to entrust the construction and upkeep of certain classes of public works to agencies other than departmental, and if so on what line such a change has to be effected has next to be considered. In order satisfactorily to answer this question it is necessary to describe the agency at present employed for the supervision of all public works in this presidency whether belonging to government, or public bodies and then to see what changes are desirable. There are three sets of engineering establishment employed (1) the Public Works Department staff employed on the construction and maintenance of all works in charge of government except minor irrigation works, (2) the minor irrigation staff for looking after minor irrigation works, and (3) the local board and municipal engineer establishment for the maintenance of roads and buildings in charge of the local bodies. This system of employing three sets of separate establishment is to a certain extent a source of waste, as they have very often to go over the same ground to reach their various spheres of work. For instance, an engineer officer of the Public Works Department goes

over a large portion of a road before he can reach his irrigation work and there is no reason whatever why he should not look after the road as well. A certain amount of economy can be secured if the following system is adopted. Each district may be divided into two or three local boards which may be entrusted with the construction and upkeep of ordinary roads, minor buildings up to a certain limit of cost and smaller irrigation works not requiring high professional skill. The government and the district boards concerned may then contribute to these boards the cost of such works as should have been constructed or maintained by them and make the boards responsible for their upkeep. These local boards may then have a staff of trained engineers and subordinates who need not possess such high qualifications as are required for the engineers employed by the government for looking after the major works. The staff employed by these boards may be placed under the control of the government engineers and technical scrutiny of their estimates. Having divested itself to the control of minor roads, buildings and irrigation works, the government may then look after the more important roads, buildings, and irrigation works by employing highly trained engineers and carry out its work on such methods as would ensure economy and efficiency. There is one great advantage in the formation of such small boards. All the works in the jurisdiction of this board being within a small sphere may be entrusted to one contractor which would stimulate the growth of private engineering enterprise and form the nucleus of large contracting firms.

2,143. (IV.) Relations with other departments and sub-branches.—The Department has been and is even now meeting the demands of other departments and there have not been any serious complaints from them on this score. The present arrangement regarding the division of the service into various branches cannot be considered to be satisfactory as it does not give room to any one to specialize in any one of the branches and the haphazard way in which the engineers are at present employed is mainly responsible for this want of specialization. When first employed, the engineer is considered to be a jack-of-all-trades and his evolution as a specialist is a matter of chance. On first entering the Department, he is posted to a district in which his duty is to familiarize himself with the work in all its branches, such as canals and other irrigation works, roads, bridges, buildings, etc. His subsequent employment also makes him a good all-round man, but does not tend to specialization. Although an all-round man may be highly desirable it is absolutely necessary that men should specialize in some branches in order that they may be really useful. More will be said on this subject when dealing with the subject of instruction in the engineering colleges.

2,144. (V.) Decentralization.—The Executive Engineers have at present no administrative powers and much time is spent in correspondence in such matters. They are the responsible heads of districts so far as the engineering operations are concerned, and may safely be entrusted with some powers of administrative approval of small original works in irrigation and the buildings relating to the Public Works Department.

(2). The powers of the Superintending Engineer with regard to administrative approval and technical sanction in regard to original works in the Irrigation Branch may be increased. As the major or productive works are carried out from borrowed funds and as any unnecessary expenditure on them is likely to increase the liability to annual recurring expenditure in the shape of interest, the government may reserve all the powers that they have now. At the same time a Superintending Engineer who generally attains the rank after a service of 19 years can be expected to have acquired sufficient professional knowledge to sanction a petty plan for a tank, sluice, or weir costing more than Rs. 2,500.

(3). The following are some of the directions in which further decentralization may be effected.

(a). Greater latitude may be given to Executive Engineers in the disposal of unserviceable tools and plant and of materials from demolished buildings or irrigation works,

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(b). Greater disciplinary powers of control to the Executive Engineer, over the clerical, lower and upper subordinates employed under him. The appointments of clerks and lower subordinates may be left in the hands of the Executive Engineers and the promotion of deserving lower subordinates to the upper subordinate establishment, and the appointment of overseers may be left to the Superintending Engineers and the Chief Engineer may have the appointment of sub-engineers with him.

(c). Greater powers to the Executive Engineers with regard to the acceptance of contracts. In fact, there seems no necessity to place any limit so long as the estimates are sanctioned by the Superintending Engineer and the government and the rates in them are not exceeded. There is also another safeguard in this direction and that is that the schedule of rates is sanctioned every year, and that any rate in excess of those entered in the schedule has to be sanctioned by the Superintending and Chief Engineers. The Executive Engineers are at present saddled with a lot of office work and have to divide their attention between it and their professional work, and any improvement in the direction of reduction of such office work is highly desirable.

(d). Greater powers to the Executive Engineers in sanctioning estimates for repairs to buildings the necessity for which has been agreed to both by the officer occupying the buildings and the Executive Engineer. The present restriction of 2 per cent. of the capital cost increases the number of estimates that have to go up and thus the office work.

(e). Powers may be given to an Executive Engineer to transfer funds from lump sum grants under the same major head.

2,145. (VI.) Simplification of procedure.—As already stated under the head decentralization, the provision in the Code paragraphs 757 and 761 regarding the letting out of works on contract may as well be relaxed leaving the Executive Engineer free to enter into contracts at rates not exceeding those in the sanctioned estimate. The provisions of paragraph 761 requiring copies of proposed advertisements for tenders to be submitted to the Superintending Engineer and the Chief Engineer do not seem to serve any useful purpose and are likely to cause delay and may therefore be relaxed.

(2). The rules regarding non-payment for materials when the contract is for finished work are working a serious hardship and have been in some cases the cause of excessive cost of works. Large quantities of materials have to be collected for large works before they can be started and if payment is prohibited for these materials till they are actually used on the work, a large amount of money will have to be sunk as dead capital and the contractor will naturally recoup his loss by charging higher rates. Another point is that there are certain seasons when the materials required for a work such as bricks, etc., can be cheaply manufactured, and if advantage is not taken of such opportunities there may not be enough material to proceed vigorously with the work, a state of things which would not occur if materials were paid for as soon as they are collected. It is therefore necessary in the interest of economy and good progress to relax the rule regarding the payment for materials.

(3). The rules regarding the execution of repairs are unduly restrictive. No useful object is served in classifying them under the heads of annual and special repairs, and in closing the former estimates at the end of every year. All repairs necessary for the proper upkeep of a work, be they annual or special, have to be carried out, and it is quite unnecessary that they should be carried out within a certain period. A restriction may be imposed that there should be only one estimate for repairs at one time. The present rules regarding the closing of annual repair estimates at the close of the year make it necessary to prepare fresh estimates for such items of work in the old estimate as have not been carried out before the lapse of the year and thus increase office work.

(4). The present budget system requires some modification. According to it the unspent balances lapse with the end of the financial year for which the grants were given and this sometimes retards works. The budget is gener-

ally prepared eight months in advance of the year and provision made for carrying out such works as far as can be foreseen and if by any accident one's forecast cannot be worked up to we shall be in a fix. Let us take for instance a work costing Ra. 3,00,000 on which we propose to spend one lakh in the first, 1½ lakhs in the second, and half a lakh in the third year. If by any unforeseen accident we are able to spend only half a lakh in the first year, we cannot spend the two lakhs in the second year even though we may be able to do so. It should be more conducive to speedy progress on a work if the grant required for the completion of the work is given once for all, leaving it to the officer to spend the amount within a certain period, spending more or less according to circumstances.

2,146. (VII.) Education.—The system of instruction in the colleges is now organized on a sufficiently broad basis to meet the needs of the government and the local bodies, and of such private agency as exists in the country. But it must be admitted that, at present, there is hardly any private agency and as for some time the men educated in these colleges have to depend on government service, the supply follows the demand and the question whether suitable candidates are attracted to the colleges is dependent on the prospects of employment of such men. It must be stated that the prospects of the Indian-trained men are not as bright as they ought to be on account of the following:—(1) only a few appointments are guaranteed every year, (2) restrictions placed regarding the selection in England of natives of India for the higher appointments in government service, (3) the division of the service into imperial and provincial and the lower pay given to the latter which has branded it as an inferior service, and (4) the closing (partial if not whole) of the door for entrance to other departments such as Revenue, Survey, Salt and Abkari, Trigonometrical Survey, Railways, and Telegraphs.

(2). The system of recruitment followed by government requires to be changed to make these colleges more popular. The recruitment in England should be open to Indian-trained men, and the selection must be based on the result of a competitive examination in engineering and allied subjects with special reference to the requirements of India. The number of appointments made in India should be increased and the distinction between the two services should be given up. If these changes are introduced and if locally-trained men are introduced freely into other departments of service, the Indian colleges will attract a better class of men and when in course of time there are opportunities for the springing up of private agency, there will be men for employment by such agency.

(3). In Madras the practice was till recently to appoint as engineer the student who stood first in the final examination held by an independent board of examiners, provided he successfully passed through the practical course. But recently the system was changed, and the rules provide for a selection by the Principal and the Chief Engineer from among the students of the engineer class who pass the final examination held by the college staff. The latter system is likely to lead to undesirable results and a reversion to the older system is recommended.

(4). The Engineering College at Madras should be strengthened by the appointment of professors in sanitary and electrical engineering in order that proper instruction may be given in these subjects.

2,147. (VIII.) Practical training.—The practical training at present given to the Indian engineers is not sufficient; the theoretical course in the college may be cut down to two years or two years and a half and more time (say two years) might be spent on practical training. It is at the time of this practical training that the student should be made to specialize in some of the branches of engineering, and ample opportunities should be afforded for such specialization. At present there is scope for practical training for men in mechanical engineering in government workshops and in civil engineering on government works. There is not much scope for training on railways and telegraphs and the Indian railway companies must be made to take a few men for practical training in

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railway construction and maintenance and opportunities should also be given in the government Telegraph Department for training in telegraph engineering.

2,148. **Prohibition against making payments during the last days of the month.**—There is no such prohibition so far as Madras is concerned except as regards making payments in the last days of March and no inconvenience has been felt in this presidency.

2,149. **Early date prescribed for the submission of the monthly accounts.**—The dates prescribed for the submission of accounts in this presidency vary from the 14th to 20th of every month and there have been no complaints of this interfering with executive work. In fact, the accounts are prepared in the office from the cash books and other vouchers relating to the payments in the month, and I cannot see how it interferes with the executive work. The accountant prepares the accounts and submits them signed "by order" to the Accountant-General, if the Executive Engineer happens to be away from headquarters and the latter officer goes through them after his return to headquarters and accepts his responsibility. This does not, in any way, interfere with his executive work.

2,150. **Prohibition against making advances to contractors.**—The provision in the Code prohibiting advances to contractors is salutary and no inconvenience has been felt from it.

2,151. **Excessiveness of audit objections.**—The complaint regarding the excessive number of objections is true, but it is not due to errors in the system of audit but to the audit officers taking up matters which are entirely within the scope of executive officers. A few examples of the kind are noted in Annexure A.

2,152. **Unsuitability of financial year.**—Some inconvenience is, no doubt, felt on this score and it would be more convenient if the financial year ended with the calendar year when the work would be slack so far as Madras is concerned. But this would require a rearrangement in all other departments, and the inconvenience does not seem to be so great as to necessitate such a thorough revolution.

2,153. **Changes in budget system.**—The experience of the past few years has shown that if proper arrangements are made and such of the grants as cannot be spent surrendered in time, we can avoid heavy payments in March and in some divisions payments in March have been less than those in any other month. The rules regarding the lapse of unspent balances is likely to retard the progress of works in some cases. As I pointed out above, some inconvenience may arise by works having to be stopped for want of additional allotments. Funds are generally granted for incomplete works, but sometimes it is found difficult to do so on account of want of provision in the current year's budget, and works may have to be stopped till funds are available.

2,154. **(General.)** There is another point which has not been referred to by the Committee, but which has caused serious inconvenience by increasing the office work in an Executive Engineer's office. I have already pointed out that as an Executive Engineer is an executive officer he should have as little of office work as possible, so that he may devote his time to his professional work, and any arrangement which increases such work is to be deprecated. The point that I wish to bring to the notice of the Committee is the increase in office work caused by the introduction of the new system of drawing salaries and travelling allowances from the treasuries introduced after the amalgamation of the civil and public works accounts. When the public works system of accounts was in force the salary or travelling allowance of the whole establishment working under the Executive Engineer could be drawn in one consolidated bill and the payments accounted for in his cash book. Even arrears of salary and travelling allowances could be drawn in the same bills and the work was confined to two such bills every month one for salary and the other for travelling allowance. According to the present system a number of bills has to be prepared one for each section of audit. Besides the number of main bills thus prepared, a number of extracts from such bills has to be prepared for encash-

ment at the sub-treasuries in the case of payments to be made to the establishment employed away from the headquarters of the Executive Engineer. In the case of changes affecting the salary or travelling allowance notified after the preparation of the main bill, a number of supplementary bills has to be prepared as these supplementary claims cannot be preferred as arrears in the next month's bills. Another direction in which the work has increased is in the number of disallowance lists proportionate to the number of bills prepared. Thus the work is nearly increased tenfold and there is a large expenditure on stationery and printing without any corresponding advantage. Another point that has to be considered in this connection is the room at present existing for defalcation or temporary misappropriation of the amounts drawn from the treasury on the salary or travelling allowance bills. No accounts are kept of the moneys so received as they cannot pass through the Executive Engineer's cash books, and it is very difficult to check what balance there should be. In order to facilitate check, unauthorized accounts have to be kept. There are now four kinds of moneys that are in the hands of an Executive Engineer (1) his proper cash balance accounted for in his cash book, (2) his contingent balance accounted for in his contingent register, (3) the unpaid amounts of the salary bills, and (4) moneys received from civil and criminal courts as subsistence allowances or *batta*, on behalf of the members of the Department who are cited as witnesses in those courts for which no accounts are authorized and their amounts have to be kept separately and to test the correctness of the actual balance four sets of accounts to be gone through. Whereas, according to the previous system, all moneys passing through the Executive Engineer's hands were accounted for in his cash book and there was only one balance and one account to be gone through. A reversion to the old system is recommended.

ANNEXURE A.

Extract from audit notes of all items in which the Accountant-General passed remarks on items which are purely of an executive nature.

November 1915.—Schedule Docket No. 121, Voucher No. 44-H, Sluice No. 1. Demolishing old masonry and earthwork excavation. A remark "found necessary during excavation as the lump sum provision was found insufficient" has been made against the above items in the voucher. Please state whether the agreement provides only a lump sum provision for these and if so how much, and why higher rates should be allowed to the contractor. The reason for increasing the rate for excavating earthwork from Rs. 4-10-0 to Rs. 5-10-0 in this bill should also be explained.

December 1915.—Schedule Docket No. 4, Cash Book Voucher No. 48-T, Rs. 254-15-2. Painting with chocolate 2 coats. This item of work has been paid for at Rs. 3 per unit in this bill while only Rs. 2-11-0 per unit was allowed in the bill paid as voucher No. 13, (c) Schedule Docket No. 3. Please explain the difference in rates.

December 1915.—Schedule Docket No. 7, Cash Book Voucher No. 32-T, Rs. 592-6-11. Pointing with *surki* mortar and white-washing Rs. 282-2-0. It was remarked against this item that the excess was due to the walls having been raised one foot higher than is provided for in the estimate. If the contractor did the extra work on his own responsibility inquires why he should be paid for the same.

December 1915.—Schedule Docket No. 5, Cash Book Voucher No. 4-M, Rs. 3,277-15-0. From this item it is seen that the contractor's agreement is for finished work. If so, please state the necessity for the purchase of scantlings departmentally and recovering the cost thereof from the contractor. If it was a condition in the agreement that the materials should be supplied departmentally then an agreement for labour only might have been taken. However please furnish data for the rate of Rs. 25.

January 1916.—Schedule Docket No. 60, Cash Book Voucher No. 13-D. Clearing silt and depositing on the berms has been paid at the rate of Rs. 9 per unit in this

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voucher, whereas the same item was paid for at the rate of Rs. 5 in Cash Book Voucher No. 48-D-55 and at Rs. 6-0-0 in Cash Book Voucher No. 43-D-56. Please explain the necessity for the difference in the rates.

June 1916.—Schedule Docket No. 36, Cash Book Voucher No. 58-N. Inquires whether there is an agreement with the contractor for this work and why no deduction is made from his bill towards security. If there is no agreement, it may please be stated why the work has been started and payment made without one.

August 1916.—Schedule Docket No. 5, Cash Book Voucher No. 81-M. for Rs. 1,778-14-10. Gates and Gate pillars. For teak-wood gates rates of Rs. 1-12-0 and Rs. 1-2-0 have been allowed. Please state why different rates have been allowed for the same kind of work.

February 1916.—Some of the items are stated to have been paid with reference to rates approved in workslips and as per schedule of rates. Please say if these items are not provided for in the agreement, and if so, why they should not be paid at those rates.

April 1915.—Schedule Docket No. 30, Cash Book Voucher No. 27-D. 1,200 gunny bags Rs. 289-0. Please state the purpose for which gunnies were used in connection with revetment.

	Rs.	A.	P.
Sheds for establishment, etc.	150	11	7
	66	0	2

Inquires how the sheds were, or will be disposed of, the work having been completed.

April 1915.—Schedule Docket No. 47, Cash Book Voucher No. 30-D. Inquires whether it would not have been more economical if the silt cleared had once for all been removed beyond the banks instead of its being deposited on the berms in the first instance and then removed beyond the banks and if so, why the latter system has been adopted.

May 1915.—Schedule Docket No. 38, Cash Book Voucher No. 2-D. The necessity for the items: rough stone-work, earthwork for foundations, levelling site, etc., is not understood in connection with planting casurina plants. Please explain.

May 1915.—Schedule Docket No. 160, Cash Book Voucher No. 42-D.—

(1) Clearing prickly pear and destroying 0-10-0 per 100 sq. ft.

(2) Turfing 0-10-0 per 100 sq. ft.

Inquires why such high rates were allowed in this bill, the usual rate being 0-4-0 for each of the items including also watering in the case of item 2. *Vide* Voucher No. 12-M, Schedule Docket Nos. 152 and 11-M, Schedule Docket No. 131.

June 1915.—Schedule Docket No. 10, Cash Book Voucher No. 21-M. Please state the distances within which the four tank works to which the pay of the *mistri* F. Subbaraya Mudaliar is charged are situated.

RAI SAHIB SRINIVASA AIYENGAR called and examined.

2,155. (*President*.) The witness stated that he was an Executive Engineer, that he had had 31 years' government service and that he had acquired his experience chiefly in the *mofussil* districts of the Madras Presidency.

2,156. Tenders were invited for entire large building and irrigation works, but though the works he had executed did not cost more than Rs. 50,000, contractors had not come forward. He had constructed a building which cost Rs. 1,00,000, but this was erected departmentally owing to its being situated at headquarters where work was done better departmentally than by contract. The supply of materials in this case was entrusted to a contractor. In his opinion the departmental system of construction was superior to the contract system for works of magnitude as the contractors available in the *mofussil* were ordinarily only petty contractors who had not sufficient capital or establishment to enable them to undertake large schemes.

2,157. He had seen some buildings erected by private individuals and they had in a few instances been erected at cheaper rates than those of the Public Works Department but he had found that the quality of the work was not satisfactory. Such work in fact had been badly carried out. The district board rates were scrutinised by the Public Works Department, and were practically the same as those of the Public Works Department.

2,158. There were no government roads in the division to which he was at present attached and his knowledge of roads was small. When he was employed in the South Arcot district he had charge of about 5 to 10 miles of metalled road and 60 miles of non-metalled roads, and these roads were maintained by government and not by the district boards as they were chiefly connected with irrigation works. The roads had not, however, been constructed wholly for the benefit of irrigation but were also intended for use by the public as they communicated with certain large towns.

2,159. He had had experience of district board works in his present division in his capacity as a member. It was not always the practice for government to appoint the Executive Engineer an *ex-officio* member of a district board and they used their discretion in the matter. The works carried out by the boards were, in his opinion, fairly satisfactory but he could not say that they were wholly so. District board work was given out after tenders had been invited, and the selection of the contractor was left to the president of the board (the Collector of the district) who was advised in the matter by

the district board engineer, and an accepted tender was not placed before the members of the board.

2,160. Public works were at present entrusted to three distinct staffs in a district, *viz.*, the Public Works Department staff, the district board staff and the minor irrigation staff. As such an organization led to unnecessary duplication of staff he suggested that all minor works might be handed over to the district boards or preferably to the *taluk* boards, of which there were one or two in each district, because the amount of work would be too great for a single board's staff. His object in making the suggestion was merely to effect concentration of work, and he did not anticipate that the district funds would be insufficient for the provision of an adequate engineering staff for the purpose for each of the *taluk* boards, as the latter would not require an engineering staff of a high standard. In his opinion, a salary of Rs. 300 to Rs. 500 a month ought to prove sufficiently attractive for the class of work they would be called upon to perform. In effect his proposal was to entrust the construction and maintenance of large buildings and important roads and irrigation works only to the Public Works Department who were better able to undertake such works. It was true that duplication of staff would still remain, but he remarked that it could not altogether be avoided, and added that only a few large works would come within the purview of the important works he recommended. He anticipated no opposition from district boards in the event of his proposal being put into operation, owing to the fact that the district boards would then be attending to two classes of work, *viz.*, government work and their own, as the boards were already under *quasi*-government control.

2,161. If all government buildings and roads were handed over to district boards, and the Public Works Department entrusted only with irrigation works, the board would require a more efficient staff for the purpose. It was true that, in some districts, the district engineer was fairly well paid and was given a salary which sometimes amounted to as much as Rs. 1,000 a month, but the majority of the boards only paid their engineers between Rs. 300 and Rs. 500 per mensem. The former class of district engineers might be able to take over all government buildings and roads work in a district, but if such a transfer were made the other districts would be obliged to employ an equally competent staff.

2,162. He agreed that it would be necessary, if government made over its buildings and roads work to district

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boards, for government to retain certain powers of control over the boards in order to ensure proper maintenance.

2,163. He was aware that the appointment and dismissal of a district engineer were subject to the approval of government, but did not know whether government could dismiss such an officer.

2,164. The irrigation works in his division consisted of tanks, river channels, reservoirs, etc., and were scattered.

2,165. He considered that the rules for the local purchase of stores should be relaxed so as to admit of a local contractor, whose firm was not included in the list of approved firms, purchasing materials from one of the recognized firms.

2,166. As an Executive Engineer he was competent to sanction estimates for buildings and roads works up to Rs. 1,000 in the case of original works, but for repairs to residential buildings he was not empowered to sanction even a Rs. 10 estimate if the capital cost of the building was Rs. 500 or more. He therefore recommended that Executive Engineers might be given larger powers of technical sanction and suggested a limit of Rs. 2,500, or even Rs. 5,000, for ordinary buildings, since the buildings usually constructed were built to type designs. There was no reason, however, for limiting an Executive Engineer's powers of technical sanction to the amounts he had suggested, or why a larger figure could not be fixed for buildings constructed to standard plans. Executive Engineers possessed powers up to Rs. 1,000 for the purchase and disposal of tools and plant and all he advocated in this connection was an increase in limit for the disposal of unserviceable tools and plant.

2,167. The disciplinary powers of an Executive Engineer were minor and that officer could not appoint or even fine a clerk or sub-overseer. He was only permitted to grant privilege leave to clerks and to exercise a limited control over the temporary works establishment. Lower subordinates and temporary clerks were appointed by the Superintending Engineer and upper subordinates by the Chief Engineer and this arrangement was prejudicial to efficiency, since every small matter had to be submitted by Executive Engineers to a higher authority. The procedure necessary for the dismissal, transfer or punishment of an inefficient subordinate entailed such a waste of time that Executive Engineers were usually loathe to take any action. An effect of this had been that there were at present in the upper subordinate staff of the Public Works Department a large number of inefficients, and he personally had had about half-a-dozen men dismissed during his service for inefficiency.

2,168. He considered that no limit ought to be imposed in the matter of the acceptance of tenders by Executive Engineers.

2,169. He did not approve of the limit fixed in the matter of an Executive Engineer's powers of sanction to repair estimates. This limit had been fixed by the Government of India at 2 per cent. of the capital cost of a building irrespective of its nature and Executive Engineers were competent to sanction repair estimates provided they did not exceed 2 per cent. of the capital value of the building and they were not in excess of Rs. 1,000. Repair estimates were prepared annually by Executive Engineers and included every item of repair work, except standard items, e.g., white washing, for which details were omitted owing to their having already been recorded in standard measurement books. In the case of standard measurements it was only necessary to refer to the number and page of the measurement book in which the detailed measurements were recorded and to enter only the total quantity in the repair estimate. As the procedure involved a great deal of time, he recommended that repair estimates be abolished and lump sum grants allotted for the repair of buildings. He did not agree with the contention that if such lump sum grants were given it would not be possible to check the amounts that were actually spent on repairs to buildings, since Executive Engineers kept annual accounts

for all residential buildings and these consisted of revenue accounts, capital accounts and repair accounts. He also did not think that under the suggested procedure it would be possible for a subordinate to bill for repair work which had not actually been done, as officers were expected to check bills for amounts above Rs. 500 and such check was possible without a detailed estimate. He considered, however, that an Executive Engineer's powers of sanction might be more limited for repairs to residential buildings, in order to restrict the expenditure on such buildings as far as possible. At present unnecessary expenditure was sometimes incurred on residential buildings owing to the divergency of opinion among civil officers as to the standard to which a residence ought to be maintained, and the Executive Engineer concerned was generally obliged to incur the increased expenditure.

2,170. He believed the amalgamation of the public works and civil accounts took place about 1910, and from his experience of the preparation of accounts before and after the amalgamation he considered that the present system had led to an increase in an Executive Engineer's work. He had referred to the matter in his memorandum which dealt mainly with the inconvenience caused to Executive Engineers in the preparation of salary and travelling allowance bills. The monthly accounts system had not as yet been altered and brought into strict conformity with the civil accounts, but he understood the earlier submission of the accounts was under contemplation though no orders had as yet been received on the subject. The date fixed for the submission of the divisional accounts was the 20th, but it was the 14th in the case of the more remote divisions in the presidency. He was not aware exactly what number of forms had to be submitted with the monthly accounts, but thought there were about 30 such forms. All compilation work was done in the Executive Engineer's office, with the exception of the works abstracts which were prepared in the subdivisional office. If the staff did their work regularly the compilation of accounts generally occupied them throughout the month as they were obliged to commence with the following month's accounts after the 20th of each month. The accounts staff had to be supplemented by men from the correspondence branch of his office whenever fair copies of accounts documents were required.

2,171. A certain amount of time was spent by Executive Engineers in disposing of frivolous audit objections, and he had furnished some instances of these in the Annexure to his memorandum.

2,172. As civil departments did not, at present, freely employ engineering students he suggested that such men might by virtue of their educational attainments be employed in the Salt, Abkari, Revenue Survey, Trigonometrical Survey and Telegraph Engineering Departments. He was not aware of the rules on the subject, but was cognisant that engineer students were not employed in the departments to which he had referred to the extent that was possible. As far as he knew only one or two had been recruited to the Revenue Survey, and about half-a-dozen for the Salt and Abkari Departments.

2,173. The practical training given in the Madras Engineering College required to be extended. The present course was a four years' one supplemented by a year's practical training, and he considered that it should be reduced to two or two and a half years in order to admit of the students receiving a longer period of practical training. His suggestion applied to both the engineer and upper subordinate classes trained in the college. He added that there was no necessity to give lower subordinates the high theoretical training they at present received, as it was not essential for the class of work they were required to perform.

2,174. He approved of the proposal to recruit a proportion of *mistris* as lower subordinates and thought that they would be more useful to the Department than the present lower subordinates. He also agreed that it would be necessary to give such *mistris* a certain

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amount of special training in surveying, estimating, etc., and added that *mistria* on promotion were, at present, given a training in surveying, levelling, etc.

2,175. He disapproved of the present rules under which the appointments in Madras were reserved exclusively for Madrassis, and men trained in certain engineering schools in Mysore were not eligible for appointments as engineers or sub-overseers in the Madras Public Works Department.

2,176. (*Mr. Cobb*). In his opinion audit raised objections in matters which were entirely of an executive nature, and he thought that objections of the nature he had cited in his written evidence, regarding the demolition of old masonry and earth-work excavation, ought to be discontinued. He also contended that objections to the payment of different rates when different lengths of cartage were involved should not be raised as the rates were invariably approved by the Superintending Engineer and really did not concern the audit officer. It was possible to prepare a classified list of objections which related entirely to executive matters, but its preparation would occupy a considerable amount of time.

2,177. With reference to the instance mentioned in his written evidence where he was asked to explain "whether it would not have been more economical to have the silt cleared out once for all by removing it beyond the banks instead of its being deposited on the berms, in the first instance and then removed beyond the banks, and if so why the latter system had been adopted," he remarked that this was purely an executive matter. The silt had to be removed from under 3 feet of water and it was therefore found necessary, in order to facilitate further removal, to dry it by placing it on the berms in the first instance, and the case was typical of the ignorance of audit in such matters. The remedy, to his mind, was to confine the Audit Department to cases involving a loss to government.

2,178. The procedure for getting rid of inefficient was a very troublesome one and he personally freed himself of them by asking for their transfer. He admitted, however, that such a practice was not commendable for the service as a whole but pleaded that he could not avoid it.

2,179. The work of district boards was controlled by the Collector, as president of the board, and the district engineer and the members of boards knew very little about their inner working. Schemes were not discussed at board meetings and estimates were simply placed on an agenda paper and passed. As he had not studied the question he was not able to suggest how district boards could best be given greater responsibility.

2,180. (*Mr. Mackenzie*). He did not agree that all municipalities were inefficient in that they were continually being deprived of their powers by government, and mentioned that he knew of some that were well managed. In his opinion municipalities were better able to control their own affairs than district boards as they did not have as many officials on their committees. Though not one district board in a hundred in the Madras Presidency had a non-official chairman certain *taluk* boards had such chairmen. He agreed, however, that such district boards and municipalities as were competent to undertake their own works satisfactorily might be given enlarged powers.

2,181. He did not think that the audit officer was obliged, whenever there was an apparent increase in rates, to call for an explanation. It was then explained to him that it had been stated in evidence that the main reason why audit officers raised objections was that the Code allowed them no discretion in the matter, and he held that audit officers ought to be accorded such a privilege.

2,182. He agreed with the suggestion that an audit officer should confine his examination of the accounts to totals and not concern himself with rates so long as the totals provided in sanctioned estimates were not exceeded.

2,183. With regard to the remark in his written evidence that "there are a good many attractions in government service, such as leave, pension, etc., which make it possible for it to get the men required at a cheaper rate than the contractor," he admitted that in making a comparison between the cost of a government and a contractor's establishment, the expense incurred by government on account of leave and pensions ought to be added to the cost of its establishment. By the remark that "the actual cost it (government) will have to incur for the sake of establishment will, in case the works are given to large contractors, be considerably more than what it would have to pay otherwise as it cannot at the same time dispense with any of the establishment it has to employ for the supervision of works," he meant that the Public Works Department establishment in the various divisions in the Madras Presidency was just sufficient to supervise works irrespective of whether large or small contractors executed them. Hence, even if contracts were given to large contractors, it was not possible to reduce the existing strength of the Public Works Department establishment.

2,184. He admitted that the remark in his written evidence that "all the works in the jurisdiction of this board being within a small sphere may be entrusted to one contractor which would stimulate the growth of private engineering enterprise and form the nucleus of large contracting firms," might be interpreted as a suggestion for an absolute monopoly, but added that what he had in mind was that works in a particular locality might be given out yearly, and that if there was an attempt on the part of a contractor to secure all the works in that locality he would probably be underbid by another contractor. He considered his proposal feasible, and thought that contractors would accept yearly contracts.

2,185. He was not prepared to indicate what "undesirable results" he considered would be brought about by the recent change in the system of the selection of students from the Madras Engineering College for appointments as engineers, under which selection was made by the Principal and Chief Engineer from among the students who passed the final examination held by the college.

2,186. (*Mr. Howley*). Prior to the amalgamation it was only necessary to prepare a single salary bill for the whole division for submission to the Examiner. Against this a cheque was drawn for the amount required for the entire headquarters staff including himself, and sub-divisional officers drew cheques for the respective amounts required for the payment of the salaries of their own staffs. Four such bills, were, however, now necessary, one for the engineer establishment, one for the upper subordinate establishment, one for the divisional establishment and one for the menial establishment and these bills were forwarded to the Accountant-General after extracts had been taken from them for the preparation of separate bills for payments at various sub-treasuries. He was thus required to sign his name about fifty times each month on bills for the payment of salaries, whereas under the old system it was only necessary for him to sign his name three times. The present system thus involved a considerable loss of time.

2,187. He admitted that it was necessary, as in other departments, to prepare a written statement of the charges against an inefficient officer and for the Executive Engineer to record his finding thereon after obtaining the accused officer's explanation before submitting the case for the orders of the Superintending Engineer. But he explained that difficulty was experienced under the procedure from the fact that some Superintending Engineers were prone to be too lenient and not view the case in the same light as the Executive Engineer.

2,188. His views in connection with the disciplinary powers of Executive Engineers were not based exclusively on his desire for powers of dismissal and appointment. He admitted that even a Superintending Engineer was

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not able to dismiss a permanent subordinate for inefficiency.

2,189. The preparation of plans and estimates for ordinary works was carried out in the office of the Executive Engineer, and only those for a few large works were prepared in that of the Superintending Engineer. He was not aware of any money limit that determined what plans ought to be prepared by the Superintending and Executive Engineers respectively.

2,190. Under the existing system of accounts, when pay was drawn for a clerk who was not present to receive

it, it was not credited in the Executive Engineer's cash book, but lay in the divisional office. A similar remark applied to money received in the divisional office which represented the subsistence allowance granted to members of the establishment when they were cited as witnesses in court. It was not the duty of the cashier in the divisional office to enter such sums in the cash book, as the cash book was intended for payments on account of works, and no entries relating to establishment were, under rule, permitted in the divisional accounts.

W. HURTON, Esq., A.M.I.C.E., Sanitary Engineer to the Government of Madras.

Written Statement.

2,191. (I.) **Economy and suitability of methods of execution of public works.**—The engineering methods of the Public Works Department are economical and generally suitable for the purpose for which they were devised.

2,192. (II.) **Encouragement of other agency.**—The execution of public buildings and roads and the system adopted at present of entrusting the execution to contractors, under which contractors send in reasonable tenders in reply to an invitation to do so, shows that sufficient encouragement is given to private enterprise. But the present system of employing private agency to contract for the erection of European store articles, which articles have been obtained from the Director General of Stores by the Public Works Department should be modified to permit of the supply of these articles in India by private agency.

(2). In the matter of the construction of water-works or other important sanitary works, the present practice in the Madras Presidency is for the Public Works Department division concerned to supervise the work, the execution being done by private agency for the work of buildings and earthwork and the laying of pipes. The pumping plant, water pipes and other materials, are obtained by the Sanitary Engineer to Government on indent from the Director General of Stores, under the existing rules, and are not supplied by the private agency. They should be supplied by private agency, and this same or other private agency should be employed, as a rule, to erect the plant and to lay the pipes, under the general inspection of the Public Works Department engineer concerned. Only in this manner do I consider any modification of the system of execution of works by the Public Works Department desirable, and the modification is required because the existing system was founded before the execution of sanitary works, on a modern scale, was introduced into India. The present system, it seems to me, subject to the above suggested modification, has grown up as the result of years of experience, and no radical alteration is necessary or advisable.

(3). It might be urged that change in the Public Works Department system, which has grown up as the result of years of experience, is probably desirable to meet modern conditions, but this does not seem to me to be applicable to the Public Works Department as criticism of its work and methods have been freely made, as might be expected of work which is visible in its results to all. Errors and omissions, in my opinion, have been magnified, and too little recognition has been accorded to the many successes, which apparently have been accepted as a matter of course.

(4). So far as sanitary works are concerned, it is not advisable to entrust their upkeep to private agency, nor can I recall any place where this is done.

(5). If the suggestion refers to a proposal to give private firms a concession to construct and maintain and run as a profit-making concern any work which is required by a town, such as water-works or drainage work or electric lighting or tramway, I am against such a policy being adopted in India, as these works should, in my opinion, be constructed and maintained solely for the public good by their representatives.

2,193. (IV.) **Relations with other departments and sub-branches.**—It is for the departments of the administration to say whether the Public Works Depart-

ment meets their needs, and for the Committee to decide whether the replies of the departments can be accepted. It is suggested that before the Committee decide the question, it would be well to obtain the views of the Public Works Department on the replies. The relations of the Buildings and Roads Branch of the Public Works Department and the Sanitary Branch are satisfactory.

2,194. (V.) **Decentralization.**—The Sanitary Branch has now become of sufficient importance to be considered an actual branch of the Public Works Department and considering the great want of sanitary works in the Madras Presidency, and that the increasing public demand will be complied with more readily after the war, it is advisable to decentralize the Sanitary Branch from the Buildings and Roads Branch of the Public Works Department and form for it, as far as advisable at present, a separate organization within the Public Works Department.

(2). I have already, some years ago, recommended to government that the present position warranted the creation of 6 or 7 Public Works Department sanitary divisions in the Madras Presidency, that is, one division under each Superintending Engineer of a circle. The principal objection to this proposal is probably the financial one that more than a certain grant cannot be given each year from revenue for sanitary works and this grant, being limited, does not warrant the increase of establishment required by my proposal. But if it is remembered that only some 25 municipalities in this Presidency of Madras have obtained protected piped water-supplies up-to-date, and that while these towns have thus achieved protection against cholera epidemics there still remain some 50 other towns without this essential protection, the possibilities of a more vigorous sanitary policy become self-evident. In addition to these 50 municipalities there are hundreds of other towns approaching the municipal stage of importance which have also to be considered. It is hardly, I venture to submit, sufficiently realized that the number of deaths from cholera in a year in the Madras Presidency amounts to an enormous total—

16,888 in 1905,
1,42,811 in 1906,
1,41,970 in 1908,
and 30,098 in 1915.

It has been established as a fact that the introduction of protected piped water-supply schemes in the Madras Presidency prevents an epidemic of cholera in a town and the recent examples of Salem, Chidambaram, Naga-patam, Vizianagram and Berhampore in addition to the older installations can be quoted. A change in the present financial policy of limiting the construction of protected water-supplies by that amount of annual revenue which can be spared is not beyond realization, and the introduction of a policy of construction based on funds from an imperial loan is, I venture to say, desirable.

(3). To revert to details of my proposals, each sanitary division was to design and execute, with the help of private agency, all the important sanitary works within the existing Public Works Department circle, under the general directions of the Superintending Engineer of the circle, who would have suitable powers of sanction for these sanitary works, and for sanitary works contemplated by local bodies. These Superintending

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Engineers were to be under the orders, so far as the Sanitary Branch was concerned, of a Chief Engineer, Sanitary Works, who would take up the direction of the Sanitary Branch from the Chief Engineer, Buildings and Roads Branch. If this proposal resulted in too much work for the Superintending Engineers, then the provisions of the Public Works Department Code which lays down rules for the increase of the cadre of Superintending Engineers when found necessary should be followed.

(4). The staff of the sanitary divisions would be recruited in the first place from engineers in the Public Works Department who have had experience or had shewn interest in sanitary works, and future recruitment would be from Assistant Engineers from England, who had had at least 3 years' experience on sanitary works in Great Britain. The sanitary staff would be imperial and liable to transfer from one province to another, so that the experience gained in different provinces could be utilized to the best advantage of the state, and would gradually become by expansion a distinctly separate branch of the Public Works Department.

2,195. (VI.) Simplification of procedure.—The Public Works Department Code is unduly restrictive especially in the two important points of—

(i) the obtaining of European stores through the India Store Department, London; and

(ii) the elaborate system of account and audit rules.

In regard to the obtaining of European stores through the India Store Department, London, I venture to suggest that this results in delay in the execution of works and therefore extra expense. The stores obtained from the India Store Department, London, are excellent in quality, in my opinion, and no complaint can be made on that score. They are also cheaper, as a rule, than stores obtained in India and consequently in every way more satisfactory. But firms in India could undoubtedly by their system of code telegram obtain stores from the manufacturers much more quickly than they can be obtained now under the system of indenting on the India Store Department. With suitable precautions such as insisting on only stores of British manufacture being obtained from local firms, and standard specifications with necessary testing centres (one at Madras), it would be desirable in the interests of industrial growth in India to permit the Public Works Department to obtain all stores in India from local firms, while at the same time the India Store Department might be maintained, at any rate for some years, to enable Public Works Department engineers to obtain stores from the India Store Department, London, if circumstances made this at any time necessary or desirable. In other words I would venture to suggest that instead of Public Works Department engineers being obliged by strict rules to obtain European stores from the India Store Department, and under certain special circumstances from local firms, the rules should be reversed making it possible for Public Works Department engineers to obtain generally all stores of British manufacture from local firms in India, with the option of indenting on the India Store Department in exceptional circumstances. This suggestion if carried out would not, I think, result ultimately in increased cost of stores, as local firms would soon realize that if their prices were unsatisfactory the contract would be lost to them and indent placed with the India Store Department, London. The adoption of this policy would result in the keeping of a minimum stock by the Public Works Stores, Madras, and other Public Works stores, and the consequent saving of interest charges and depreciation on stock and surplus stores. It would in all cases be advisable for these Public Works stores to keep in stock, for immediate use, engines and pumps and other construction plant, with the necessary workshops for repair purposes, for issue as at present to the Department or to private agencies undertaking work on contract.

(2). In the matter of audit restrictions these have been I think complained of by all Public Works engineers throughout India. Apparently the restrictions are

increasing and not decreasing, and undoubtedly such restrictions have a blighting effect on the execution of works by the Public Works Department. The question of whether the restrictive nature of the Public Works Department Code rules and the system of accounts and audit prevailing at present results in any actual saving to government, when the cost of the establishment necessary for these purposes is taken into account, is one which should receive, in my opinion, careful consideration from any future Committee appointed to consider inquiries into the working of the Public Works Department. If I understand aright, the references to private agency in the resolution appointing the present Committee, it seems that proposals are under consideration for the execution of public works by private agency, and to enable this to be done the Public Works Department Code rules on execution and audit are both intended to be relaxed. It seems to me that, as it is generally the case that such Code rules are restrictive on Public Works engineers, these rules should be relaxed in the first place for Public Works engineers, and it should be seen what effect this relaxation has on the speed and economy of execution of works under the present Public Works Department system, before a change is made in the system of execution. Apparently, it is intended to give private agency special advantages; should not then these special advantages be given to government officers of the Public Works Department in the first instance? And should this large question of the restrictive nature of the existing rules not be made the subject of an exhaustive inquiry and a new Public Works Department Code embodying less restrictive rules issued by government?

2,196. (VII.) Education.—I have always noticed, since the beginning of my service in India in 1892, that the theoretical knowledge of the men, especially in irrigation questions and also in surveying, who have been trained in the College of Engineering, Madras, has been very good, and consequently I consider that the training in this college meets the requirements of government and also of private agency. I do not think any change is required except increased study of sanitary engineering, and perhaps of architecture, which two subjects during the last 25 years have become prominent in the Presidency of Madras.

(2). The course of study for engineers is four years in the college, and one year on practical work. The syllabus should be arranged to give more study to sanitary engineering special subjects which might embrace the equivalent of 6 months' study of this subject, and more study, possibly 3 months, of architecture. Also, I am not in favour of the division of the engineer students into two branches—civil and mechanical, but consider that all students should take the same course and qualify in mathematics, science, civil, mechanical and sanitary engineering and architecture. The length of the time spent in the college, four years, should not be extended and consequently the syllabus should be re-arranged.

2,197. (VIII.) Practical training.—The training of the students of the Engineering College, Madras, on practical work, in a Public Works Department division or workshop for one year, is satisfactory, but it should be extended by 9 months to include 6 months' training on sanitary works, such as execution of water-supply or drainage work and 3 months' inspection of works throughout the Presidency of Madras, so as to widen the local views of works in the minds of the students. In the case of students trained at English colleges, I venture to say that they should receive the usual training in England following the theoretical training, and subsequent training in India should be during actual employment on works.

2,198. (General). The following statement is made in the resolution appointing the Public Works Department Reorganization Committee:—"Much work of a simple and unimportant character which is now undertaken and supervised by highly salaried officers of Government could, it has been suggested, be carried out at reduced cost under contract subject to Government inspection." In my experience such work if of a simple and unimportant character is supervised by

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subordinate officers of government, who are not paid high salaries but salaries in proportion to the work they supervise. Also it is not, in my opinion, correct to say that if such work were carried out under contract it would be done "at a reduced cost." I venture to submit that the suggested change would result in increased cost to government. It should also not be overlooked, in considering the statement in the resolution, that such works are already carried out under contract, and in exceptional cases by departmental agency when contractors are not forthcoming or are unreasonable in their tendered rates.

(2). The second point in the resolution is:—"It is urged that, if the local bodies are encouraged and enabled to arrange more extensively than at present for the execution by their own staff or by private agency of their works, it will not only be a further step in the direction of decentralization but also would stimulate the growth of firms of standing in the building and allied trades and so encourage further industrial activity." The extent to which local bodies could carry out the terms of this proposal depends entirely on the competence of their engineering staff. In the case of district boards in this presidency who employ engineers, the competence of these engineers is not usually equal to that of Executive Engineers of the Public Works Department, and consequently the powers of technical sanction to estimates should not exceed the powers granted to the Executive Engineers of the Public Works Department. If the works proposed to be undertaken by district boards, as suggested in the resolution, were of any magnitude, it would be necessary for the district board to employ temporarily special engineers to supervise them, and judging from the type of applicant seeking employment it is thought that this method of executing important works would not be satisfactory to the district board. At present such works are executed by the local Public Works division with its chain of

responsibility complete from the Executive Engineer through the Superintending Engineer to the Chief Engineer. An officer of the Public Works Department on completion of an important work in one district can be posted to another in an adjoining district, but as each district board is independent of the next this transfer could not be carried out by a district board, and the employment of temporary engineers by district boards, to supervise the private agency executing important works, would not be advisable. It is also considered that a district board engineer has quite sufficient work at present in looking after repairs to roads and buildings and in executing with his staff the less important works carried out by district boards. The district board in this presidency is too small an unit to permit of the employment of the requisite superior staff that would be required if the suggestion in the resolution were adopted.

(3). As regards the suggestion that the proposal in the resolution would encourage the growth of firms of standing in the building and allied trades and so encourage industrial activity, it seems to me, and I have stated this in reply to other questions, that the growth of firms of contractors is encouraged in every way at present, except in the supply of European stores, but it might be suggested that government in the Public Works Department might especially encourage men (engineers) who are likely to make good contractors, by financing these men for a term of years, say five, to enable them to establish themselves as successful contractors. Under the present system a man must either have capital himself or raise it among his friends and too often the deficiency in amount has to be made up by recourse to money-lenders at rates of interest which must eat up the profit due to the contractor's exertions. The men selected should, I venture to submit, be selected from the officers and subordinates of the Public Works Department with the requisite experience.

MR. W. HUTTON called and examined.

2,199. (President.) The witness stated that he had been the Sanitary Engineer to the Government of Madras since the year 1903. He was a Coopers Hill Engineer and had been posted to the regular Public Works Department establishment in 1891, as an Assistant Engineer. The special qualifications he possessed for the post of Sanitary Engineer were that during his practical course after leaving college he had been on the Manchester water-works, and that he had subsequently, during a period of 2½ years' furlough, studied sanitary engineering, visited several water and drainage works and passed an examination in sanitary engineering conducted by the Municipal and County Engineers of London. Hence he had really specialized in sanitary engineering after joining the Department.

2,200. Designs for sanitary projects were prepared either by himself or his deputy, and their construction was carried out by the executive division of the Public Works Department within whose charge the work was situated. He was only consulted during construction by the Executive and Superintending Engineers if such officers thought a reference to him was necessary, but it was optional to him to conduct inspections and to forward copies of an inspection note, dealing with points noticed, to the Superintending and Chief Engineers. The sanitary works generally undertaken were on behalf of municipalities, but a few district boards had constructed small works after his approval to the plans and estimates. All the large municipal works, however, had been executed by the Public Works Department and not by the municipalities.

2,201. He was not directly connected with the Madras Corporation, but government consulted him on its schemes. That corporation employed its own civil engineer in addition to a special engineer for water-supply and drainage. No other town in the presidency had any special sanitary engineering establishment of its own. They had engineers of inferior calibre, but no fully-qualified engineer.

2,202. Sanitary works were usually carried out by the Public Works Department either on the piece-work system, or departmentally, because large contractors were not procurable. The Department had, doubtless, endeavoured to give work to such contractors, and found that they would not come forward unless they were allowed to provide both labour and materials. Even if private agency were available, he thought that the Department would prefer the system at present in vogue. He was aware that sanitary works were carried out by large contractors in Bengal, but explained that the reason for this was that some provinces, e.g., the United Provinces and Bengal, did not place a strict interpretation on the Code rule on the subject and held that the rule authorized the employment of large contractors in such cases, and apparently also the supply of cast iron pipes and pumping plant. In Madras, on the other hand, it was held that the rule prohibited the employment of large contractors in cases in which the work included the supply of European stores. He thought, however, that the practice adopted in some of the other provinces would work well in the Madras Presidency, and that it would be quite feasible to execute sanitary projects by private agency if permission were accorded. It would, however, prove more expensive as the Madras Public Works Department erected their works at a minimum cost. There were no firms in Madras which were capable of undertaking large sanitary projects, but some of the Calcutta and Bombay firms had agencies in the city and would be prepared to undertake such work.

2,203. In the matter of the local purchase of European stores, he was of opinion that the existing rules should be revised so as to empower an engineer to purchase locally imported articles of European manufacture if he considered such a course more economical. He did not agree that there was any force in the contention that such permission would place the local officer entirely in the hands of local firms and thought that his position

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would be no worse than it was now. In his opinion, sanitary appliances could be purchased locally at a reasonable price, though perhaps not quite as cheaply as in England, but in view of the expeditious manner in which they could be obtained, he deemed it expedient to permit their local purchase.

2,204. He advocated the reorganization of the Sanitary Branch and its separation from the existing Buildings and Roads Branch of the Public Works Department and proposed that the sanitary establishment in Madras should consist of a Sanitary Chief Engineer and six or seven Executive Engineers, i.e., one for each circle of superintendence. For the commencement the Executive Engineers he proposed would work directly under the present Superintending Engineers of circles, but when they were ultimately senior enough to justify their promotion he thought that they might be raised to the rank of Superintending Engineer by the creation of three such appointments. He admitted that his scheme suffered from the disadvantage that the Superintending Engineers would be subordinate to three instead of to two Chief Engineers, but he had advisedly retained the Superintending Engineer in the link of procedure as that officer had a smaller area to superintend than the Chief Engineer, and would thus be in a better position to supervise works. All the sanitary works, he anticipated, would be too scattered for one officer to control.

2,205. He next recommended that for a start the Executive Engineers he proposed might be recruited from amongst those Executive Engineers in the Department who had received some training under the existing system on water and drainage works. The difficulty in immediate recruitment from England would be that men so obtained would be inexperienced in Indian conditions. His proposal in effect was that a certain number of Assistant Engineers should be recruited from England and be attached to the ordinary work of the Department, until such time as their seniority and qualifications fitted them for the charge of executive sanitary divisions.

2,206. He considered that the sanitary service he had proposed should be an imperial one and that its officers should be liable to transfer to any part of India, triennially, so that the experience gained in one province might prove useful on transfer to another province. A sanitary Executive Engineer with 12 years' service would thus have had experience of three provinces and by the time he attained the rank of Superintending Engineer he would probably have been posted to four different provinces if his services had been retained for five years in each province. They could then be posted as Superintending Engineers to provinces where they had served previously and thus combine their local knowledge with the experiences gained in other provinces. He did not think that the expenditure entailed in the acquisition of such local knowledge could be considered expensive when weighed against its numerous advantages. He added that his scheme was somewhat analogous to that followed in the Railway Department where inspectors were liable to transfer from one province to another.

2,207. He quite agreed with the general trend of opinion that too much of an engineer's time was occupied in the examination of accounts documents which were really not essential for purposes of audit. His views were based on his experiences as an Executive and Sanitary Engineer. He admitted, however, that as a Superintending Engineer and Sanitary Engineer to Government he had practically no concern with accounts and that his experiences of audit objections were confined to the time when he held executive rank.

2,208. He proposed that every student should, under the present methods of execution of works, receive practical training on sanitary works for six months in addition to the one year's training which they already received on other works, and he considered that all civil engineers should undergo a course of training on sanitary works under present conditions.

2,209. The normal annual expenditure on sanitary works in the Madras Presidency varied between

Rs. 12,00,000 and Rs. 20,00,000, and he earnestly hoped that the sanitary grants would be largely augmented as he believed that sanitary works were a first charge on the public revenues in any movements for improvement of the country's resources. Besides drawing up the details connected with this expenditure he had a great deal of maintenance work and was required to advise local bodies free of charge. As an indication of the extent of such work he stated that in 1914 he scrutinised plans and estimates for works prepared by local bodies the cost of which came to about Rs. 29,40,000. He did not as a rule inspect local sanitary works whilst they were under construction and he, or his assistant, only advised local boards before estimates were prepared as to how they should be drawn up.

2,210. He had two Deputy and four Assistant Sanitary Engineers under him. The Deputy Sanitary Engineers ranked as Executive Engineers and were paid Rs. 700 a month, and the Assistants ranked as Assistant Engineers and were on a scale of Rs. 300—Rs. 500 a month. Their duties consisted of the preparation of plans and estimates under his general supervision, and the inspection of existing water-works and no charges were levied for such inspections either by himself or by the officers under him. The senior boiler inspector was also placed under him and that officer inspected water-works pumping stations and advised as to their repairs, but in his case a special charge was made as his inspection was a detailed one. Neither the Sanitary Engineer nor his Assistants were empowered to issue any orders to local bodies but they could bring defects to notice through the medium of inspection notes, and if they were not remedied within three months of the receipt by the local body of the inspection note a reference was made to the local Government which enforced immediate action. He did not know whether the local Government possessed statutory powers in this direction, but explained that all the local Government did was to write to the local board stating that it noted with displeasure that a particular work had not been properly maintained and that it was desirable that the necessary repairs should be effected within three months, and the request generally had the desired effect.

2,211. (*Mr. Cobb.*) If he were given the full complement of staff which he had asked for he could spend Rs. 40,00,000 to Rs. 50,00,000 a year in the Madras Presidency.

2,212. The Madras Corporation had its own special sanitary engineer, and he was not its consulting engineer though as Sanitary Engineer to Government certain municipal matters were referred to him for opinion.

2,213. In his opinion the restrictions in the matter of the local purchase of European stores should be removed even if their purchase in India was somewhat more expensive, but it was advisable if the concession were granted to rule that no article which was dearer by more than 5 per cent. should be so procured. An alternative provision authorising the submission of indents to England when necessary would help to keep down prices in India.

2,214. He proposed that a committee consisting of three engineers and two accounts officers should be appointed to examine and report on the question of the reduction of audit objections, such report being submitted to government in due course for its consideration. As a minor remedy he suggested the abolition of the present system under which audit notes were compiled by clerks in the Accountant-General's office in which he believed a clerk was not considered competent unless he brought to notice a number of audit objections. He believed that the objections raised in consequence were so numerous that the Assistant Accountant-General had not the time to examine them and forwarded them as prepared by the clerks to the Executive Engineers. He therefore proposed that the Deputy or Assistant Accountant-General should, in future, look more closely into audit notes and objectionable items statements.

2,215. (*Mr. Mackenzie.*) Madras had a sanitary board similar to the board in Calcutta. The Sanitary Engi-

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neer in Madras was directly under the Chief Engineer, while in Calcutta he was under the sanitary board on which the Chief Engineer had a seat and he preferred the latter system. The Chief Engineer of the Buildings and Roads Branch in Madras was also president of the sanitary board, but the Chief Engineer, Irrigation Branch, had not a seat on the board.

2,216. He did not approve of the proposal to transfer the office of the Director General of Stores to India as he thought the Department would continue to labour under the same difficulties. Nor did he approve of the suggestion to appoint an official buyer in the capital of each province. He added that if it was intended to encourage Indian industries, the best and simplest course, in his opinion, was to abolish the European stores rules altogether.

2,217. If large contractors were employed on sanitary works they would execute them on the piece-work system

and the works would prove more expensive. He had proposed the execution of such work by large contractors as efficient petty contractors were not available.

2,218. Works were debited with a charge for the tools and plant used on them, but under recent orders no charge was made when the tools were not actually used nor was interest charged on the capital thus locked up.

2,219. He stated that the committees which considered the syllabus of the Madras Engineering College did not give due regard to the need for instruction in sanitary engineering, and that they had not to his knowledge consulted the Sanitary Engineer in the matter.

2,220. In his opinion there should be a practical course of two years instead of one, part of which might be spent on sanitary works, even if the extended practical course necessitated the curtailment of the theoretical course.

E. J. B. GREENWOOD, ESQ., A.M.I.E.E., Electric Inspector to the Government of Madras.

Written Statement.

2,221. (*Qualifications.*) An electrical engineer by training. Appointed in London to the present post in January 1913 by the Secretary of State, after an eight years' mechanical and electrical works training and three years University course. A B.Sc., with Honours in Electrical Engineering, raised to M.Sc. in 1916, of the University of Leeds. An Associate Member of the Institution of Electrical Engineers. Original agreement period of three years extended in February 1916 by another period of three years.

2,222. (*Duties.*) Statutory under the Indian Electricity Act, 1910, and advisory as Electrical Engineer to Government.

2,223. (I.) *Economy and suitability of methods of execution of public works.*—The methods at present adopted in this province for the execution of electrical works while not being uneconomical and unsuitable for the purpose for which they were devised could be improved in certain directions. The directions in which improvement can be made are:—(a) administration, (b) working facilities, (c) establishment.

(a). *Administration.*—The system of execution of works in this presidency is that the Superintending Engineer is in administrative charge, with an electrical sub-divisional officer for the presidency town; in the *mofussil* there is no special electrical officer the work being carried out by the Executive Engineers. The Electric Inspector has no executive office and is practically a consulting engineer; nevertheless as the principal electrical officer, government look to him as responsible. As electrical works are gradually increasing and involve considerable capital expenditure it would be in the best interests of government that both the erection and maintenance of these works should be controlled by the principal electrical officer. The Electric Inspector makes regular inspections and tests of government installations and forwards his report to the Superintending Engineers for such attention as they may receive. The Superintending Engineers and Executive Engineers can call on the Electric Inspector for advice and assistance. This system of working has not proved satisfactory, the reason being the indirectness and small control of the Electric Inspector and especially in *mofussil* work the absence of electrically-trained supervision. A system of administration by which a civil engineer is placed in charge of electrical works and the principal electrical officer has only an advisory voice can never prove satisfactory.

The defects have shown themselves in the following directions:—

(i) the maintenance of electrical installations is not satisfactory as the Electric Inspector has no control after his report has been submitted;

(ii) the execution of new works is carried out in the presidency town by the electrical sub-divisional officer a fully-qualified man but of junior experience; in the

mofussil little new work has been carried out but that little could be inspected by the Electric Inspector only a few times during execution; such few inspections, however, are not sufficient to ensure that the whole of the workmanship and hidden details are satisfactory.

It is pointed out that only as recently as May 1916 was the electrical sub-divisional officer a qualified electrical engineer, and the defects of previous administration are now being put right.

(b). *Working facilities.*—The purchase of electrical materials cannot be made in large quantities owing to the absence of store room. It should be possible to obtain the advantage of buying in large quantities at correspondingly cheap rates all the usual materials required for the maintenance of electrical installations and to have a suitable central store for which distribution as required may be made. The Public Works stores would still stock the ordinary articles such as oils, small stores, etc., but the stock of electrical materials would be kept by the executive electrical officer.

In Madras there are 69 electrical installations with a capital cost of approximately nine lakhs of rupees and apart from the actual cost of current consumption approximately Rs. 44,000 were spent on their maintenance during the last year. The repair of small electrical apparatus cannot be economically and conveniently carried out by outside agency, a small repair shop is an essential in the maintenance of electrical installations.

(c). *Establishment.*—At present the Superintending Engineer, a civil engineer, controls the selection and appointment of the subordinate electrical establishment; in my opinion this is not sound and in practice has proved unsatisfactory. The principal electrical officer would be a more suitable man for such important work.

2,224. (II.) *Encouragement of other agency.*—Private enterprise in so far as the construction of new electrical works is concerned is in my opinion sufficiently encouraged. With the exception of small repair work which represents possibly 2 per cent. of the total all work is carried out by outside agency. It would be neither economical nor convenient that petty repair work should be so carried out. In the case of a repair work of large magnitude tenders are obtained and the work carried out by outside agency.

(2). Unless the firms obtain a very much better supervisory and working staff than at present it would not be possible to entrust the upkeep of electrical installations to them. The maintenance of an electrical installation consists of attention to such a large number of details that the supervision of the firms to whom the maintenance had been entrusted would require practically the same departmental supervisory staff as at present employed. It is possible, however, that some such upkeep arrangement might be made, but I doubt whether it would prove satisfactory and economical. The average working man employed by local firms is a very poorly-skilled man and usually learns his trade on govern-

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[Continued.]

ment or other work. I recommend therefore that no change be made in this matter.

2,225. (III.) Changes in organization.—I would recommend that an electrical section corresponding to the sanitary section of the Public Works Department be made. At its head should be an experienced Electrical Engineer ranking as Superintending Engineer and responsible for all electrical work in the presidency. For the carrying out and maintenance of works an executive Electrical Engineer would be required and one would suffice at present; the presidency would be divided into two sub-divisions, the presidency town and the *mofussil*, each in charge of a qualified sub-divisional officer.

(2). The duties of Electric Inspector under the Indian Electricity Act, 1910, require the services of a qualified Electrical Engineer; and experience has shown the inadvisability of the Electric Inspector being also the executive officer for electrical work. It is desirable therefore that the Electric Inspector should be a Superintending Electrical Engineer and not an executive officer, and until there is sufficient work to warrant the employment of any additional electrical officer, one officer should and may hold out both offices of Superintending Electrical Engineer and Electric Inspector. When the statutory work increases additional Electric Inspectors would be required, the Superintending Electrical Engineer becoming *ex-officio* the Chief Electric Inspector for the province.

(3). In this connection I would bring before the Committee the subject of the pay, status, etc., of the Electrical Engineers in government employ. The attached sheet (Annexure A) shows the whole list of such officers and it will be seen that the conditions of service, pay, status, etc., differ very considerably in the different provinces. The only explanation possible is the comparative isolation of the various officers, for the work for which they are appointed is practically the same throughout India. The status of the Electric Inspector, Madras, has never been defined; in pay, he is an Assistant Engineer although he may have 14 years' engineering experience as in my case, in travelling allowance he is a first-class officer, and in correspondence he deals direct with the Chief Engineer. The stigmas of 'temporary' and 'attached to the Public Works Department' deprive him of any definite status.

(4). There seems no reason why an Electric Inspector should not be graded *pari passu* with corresponding officers of the imperial branch of the Public Works Department and rise with them. In all cases an Electric Inspector starts his service in India later in life than the Assistant Engineers of the Public Works Department and it would only be fair to add at least five years to his service in grading him.

(5). Apart from pay and status, an Electrical Engineer should be given European Service Leave Rules, and either a pension or a special provident fund similar to that on state railways. It would make the electrical service much more attractive and would give the electrical specialists a more varied experience, thus increasing their value to government, if there were some system of transfers from a junior province to one of greater electrical importance; all new men should commence their service in a province of small electrical importance. The Government of India should be given powers to make these transfers.

2,226. (IV.) Relations with other departments and sub-branches.—The Public Works Department does meet the needs of other departments of the administration, but for some inexplicable reason such departments do not make full use of the Public Works Department. For example the Medical, the Industries, the Survey and the Press Departments spend considerable sums of money on electrical apparatus without consulting government's electrical officer. Such apparatus is often neither suitable for its work nor for the climate and in general the money is not spent to the best advantage. The relations between the Electrical and other branches of the Department are in my opinion in general satisfactory.

2,227. (V.) Decentralization.—Further decentralization in the matter of granting administrative sanction to estimates for new electrical work is required. At present the power to accord administrative sanction to proposals for electrical installations in government buildings rests only with government. The absence of any authority in selected heads of departments to accord administrative sanction to electrical estimates results in an avoidable increase of correspondence. As an example, the installation of one additional wall plug costing say Rs. 23 requires submission to government and the time occupied in obtaining sanction is usually three or four months. Under the existing procedure large clerical work is unavoidable as every proposal however small has to be submitted to government before it can be technically sanctioned by the Superintending Engineer. I submit that Superintending Engineers and other heads of departments who exercise large powers of sanction in other directions may safely be invested with authority to accord administrative sanction to electrical works up to a certain limit. I propose that small estimates should be administratively sanctioned by heads of departments within their powers of sanction and technically sanctioned by the Electric Inspector; and that large estimates of value exceeding the powers of heads of departments be administratively sanctioned by government, and technically sanctioned by the Electric Inspector for works not exceeding Rs. 20,000 and by the Chief Engineer for larger works.

2,228. (VI.) Simplification of procedure.—When the Public Works Code was originally prepared electrical works were of course not contemplated, the first electrical work in this presidency being dated 1905. Notwithstanding this the Public Works Department Code is not unduly restrictive in the execution and maintenance of electrical works; a few standard forms not suitable for electrical works have been modified.

2,229. (VII.) Education.—The local engineering college has only recently, some 16 months ago, seriously taken up the teaching of electrical engineering. For the last three years the mechanical engineer students of the engineer grade, as distinct from the lower subordinate and upper subordinate grades, have been given some small instruction in electrical engineering, but none of such students have as yet been employed on the electrical side of the Public Works Department.

(2). No facilities exist for instruction in electrical engineering of a standard to suit the post of electrical overseer in the Department; at present the Victoria Technical Institute of Bombay provides practically all the trained electrical men above the wireman grade that are employed by the private firms and by government.

(3). There is a real demand here for instruction similar to that provided at the institute in Bombay; and I would suggest that the existing technical institutes in this presidency be encouraged to offer higher instruction, leaving the engineering college to provide the highest class of instruction.

(4). It is interesting to note that there is a movement under consideration to start at the local trades school an electrical wiremen's class of instruction.

2,230. (VIII.) Practical training.—To the electrical sub-divisional office each year two passed students of the engineering college are posted for a six months, training. After that time they are posted to the civil engineering side of the Public Works Department for another period of six months; and at the end of the year are set free of the Department and wait for a vacancy. This period of six months electrical training is quite inadequate and for all practical purposes is a waste of time; such men are quite unsuitable to take up any electrical charge such as overseer. During the two periods of six months these men are paid a very small salary, Rs. 20 or Rs. 25 per mensem, but if the apprenticeship spirit is to be fostered they should work free. Further the period of apprenticeship or training should be three years, but there is no necessity to bind the students by a legal agreement.

ANNEXURE A.

Table of Electrical Branch of the Public Works Department, Imperial and Provincial.

Province.	Appointment.	Incumbent.	Permanent or Temporary.	Status in Public Works Department for purpose of Travelling Allowance.	Pensionable or Provident Fund.	Consolidated pay.	Leave Rules.	Age on first appointment.	
								Y.	M.
India	Electrical Adviser.	J. W. Meares, M.I.E.E. (a) M.I.C.E.	Permanent.	Superintending Engineer, 1st class.	Pensionable.	Rs. 1,000—50—1,600	European.	26	8
Madras	Electric Inspector.	E. J. B. Greenwood, M.Sc., A.M.I.E.E. (b).	Temporary.	1st class officer.	Non-pensionable.	650—50—750	Paragraph 395, P. W. D. Code, Volume I.	26	5
Bombay	Electrical engineer.	W. F. Stuart-Menteth, A.M.I.C.E., M.I.E.E., A.C.G.I. (a).	Do.	Do.	Do.	1,000—50—1,200	Paragraph 396, P. W. D. Code, Volume I.	31	5
Do.	Electric Inspector.	F. W. Wilson, A.M., I.C.E., A.M.I.E.E. (b).	Do.	Do.	Do.	800—50—1,000	European.	26	10
Do.	Electric Inspector. (Sind).	W. L. Stevenson (a).	Do.	Not known.	Special Provident Fund. Not known.	Draws Bombay House Allowance. 450—20—550	Not known.	33	10
Bengal	Electric Inspector.	R. J. Browne, M.I.C.E., M.I.E.E. (a).	Permanent.	1st class officer.	Non-pensionable Special Provident Fund.	600—40—1,000	European.	36	2
Do.	Executive Engineer, Electrical Division.	A. K. Taylor, A.M. I.C.E., M.I.E.E., A.C.G.I. (b).	Do.	Executive Engineer.	Non-pensionable Special Provident Fund.	Emoluments personal to Mr. Browne. Rs. 1,100. 600—40—1,000	Do.	31	8
United Provinces	Electric Inspector.	H. C. G. Tufnell * (b) On military duty.	Temporary.	1st class officer.	Non-pensionable.	880—40—1,000 (personal to Mr. Taylor) 700—800	Paragraph 395, P. W. D. Code, Volume I.	29	5
Do.	Do.	W. Bell, A.I.E.E. (a) Officiating.	Do.	Not known.	Do.	800	Not known.	30	6
Punjab	Electrical Engineer and Electric Inspector.	C. C. T. Eastgate, M.I.E.E.* (b).	Do.	Executive Engineer.	Do. General Provident Fund.	800	Paragraph 395, P. W. D. Code, Volume I.	36	10
Burma	Electric Inspector.	B. Raikes * (b).	Permanent.	1st class officer.	Non-pensionable Special Provident Fund.	600—40—1,000 plus local allowance of Rs. 100 while serving in Burma. 600—50—800	European.	31	11
Bihar and Orissa	Do.	A. N. McIntyre, A.M. I.E.E.* (a).	Temporary.	Executive Engineer.	Non-pensionable Special Provident Fund.	600—50—800	Indian.	20	6
Central Provinces	Do.	C. M. B. Mersh, A.M., I.E.E. (a).	Do.	Do.	Not known.	500—40—700	Not known.	28	8
Delhi	Electrical Engineer and Electric Inspector.	J. S. Pitkeathly, C.V. O., A.M.I.E.E., A.M. I.M.E., M.S.W.M.I.* (a).	Permanent.	1st class officer.	Non-pensionable Special Provident Fund.	1,000—50—1,500	European.	26	10

* Liable to serve in any part of India.

(a) Recruited in India.

(b) Recruited in England.

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[Continued.]

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[Continued.]

MR. E. J. B. GREENWOOD called and examined.

2,231. (*President.*) The witness stated that he was the Electric Inspector to the Government of Madras and that he had held that post, which was his first government appointment, for four years. He had been recruited in England.

2,232. His functions were of two classes, statutory and advisory. The percentage of cases coming under the former category amounted to about 50 or 60 per cent., and were connected with the administration of the Indian Electricity Act, and those under the latter about 40 per cent. There were sixty-five government electrical installations in Madras city; there were also ten government lighting plants in the *mofussil*; these were all small and their capacity varied between 8 and 80 horse power. The number of statutory installations with plant in the *mofussil* which had to be inspected was a hundred and seven, but that number did not include many smaller installations. Lastly, there was a very large government military installation in the cordite factory at Aravankadu which he visited in his capacity as Electric Inspector to Government, but not as an electrical engineer.

2,233. He inspected government installations periodically and forwarded his inspection notes to the Superintending Engineer. He had no executive power in the matter of such installations, but merely tendered advice as the result of his inspections. Such a position was undoubtedly unsatisfactory, and he desired to have executive charge of these electrical installations in place of the Executive Engineer, but unfortunately the statutory and executive duties could not be worked in conjunction as the Electric Inspector had sometimes to act as arbiter in disputes between the government and private parties, e.g., if a dispute had arisen in the case of service lines, or as to whether the supply was satisfactory or not, or as to whether the fault was on the government or contracting side, he would be called upon to arbitrate.

2,234. In his opinion, the Electrical Engineer in Bombay did not perform all his (the witness's) duties, as in the Bombay Presidency there was also an Electric Inspector subordinate to the Electrical Engineer who was the final authority in electrical matters. In certain cases which had arisen in Madras the Electric Inspector had performed both the judicial and executive duties and the local electric supply company had approached government with a request for two electrical officers, and he recommended that two such officers should be employed.

2,235. The repair work of government electrical installations was unsatisfactory and the proper standard of work had not been maintained though it had lately improved. The reason for this was that the workmanship of the wiremen and fitters was very poor.

2,236. He advocated the creation of a separate electrical department under an Electric Inspector with the status of a Superintending Engineer, and proposed that that officer should be given a staff of one electrical Executive Engineer and two sub-divisional officers for wholly executive duties. The statutory work he explained would under his proposal continue to be performed by the Electric Inspector until the increase in the work justified the employment of two officers. He was not in favour of the entertainment at present of an Electric Inspector in addition to the staff he had proposed and remarked that although the Electric Inspector and the Electrical Executive Engineer would work independently under his scheme it did not matter if one was subordinate to the other as such an arrangement had worked well in Bombay.

2,237. The capital value of the government installations in the Madras Presidency amounted to Rs. 9,00,000 and the annual expenditure on their maintenance to Rs. 1,50,000. Very little expenditure had been incurred on new works during the last few years. Estimates aggregating Rs. 3,00,000 or Rs. 4,00,000 had been framed for lighting but he did not anticipate that the average annual expenditure on this account would

amount to more than Rs. 1,00,000 for the next five years.

2,238. The Electric Inspector would be liable to transfer from one province to another, under his scheme.

2,239. He drew attention to the fact that although there was an electrical staff at present its advice was not obtained in connection with the electrical work of other branches of government, and illustrated his remark by stating that though he was consulted regarding the installation of fans and lights in a medical laboratory he was not consulted regarding the electrical apparatus in the laboratory itself apparently because such apparatus had to fulfil certain medical tests and was therefore regarded as more within the province of the medical authorities. Nevertheless he recommended that no purchases of electrical apparatus should be effected without first obtaining his advice as the practice led to wasteful expenditure from the public revenues.

2,240. He had visited the Madras Engineering College and discussed the new syllabus of instruction then under preparation. The present course for mechanical and electrical engineering was a combined one and the new course which was a five year one provided for the study of mechanical and electrical engineering for the first three years, special subjects in the fourth year and electrical engineering exclusively in the fifth year. He had expressed his disapproval of the new course as he considered five years was much too long a period seeing that a man when he entered the college had already received a fairly high standard of general education and was required to undergo further practical training at the close of his college course, e.g., a man after two years' study at an Arts college would, on entering the Madras Engineering College, be required to study for five years at the end of which he would probably be required to undergo two years' practical training thus making nine years altogether. In his opinion the new college course should be of three years' duration, and an additional three years should be devoted to practical training.

2,241. Students received electrical training at the Chinga Raj Technical Institution in Vepery, but he had no experience of the course having only once visited the institution. It trained wiremen who were capable of performing the duties assigned to them and his experience of such men had been satisfactory. The local trades school in Madras had a plumbing and mechanical engineering class and it was proposed to include a class for wiremen.

2,242. Two students from the Madras Engineering College had been sent to the electrical sub-division office for six months' training, but he had had no connection with them. In his opinion, six months' training was hardly of much value as usually students undergoing such training frittered away their time. In some cases the students had a slight electrical knowledge, and the benefit derived from their practical training in electricity depended a great deal on the students themselves.

2,243. He was in favour of the licensing of wiremen prior to their practising as such, but he thought the introduction of such a system would be a very difficult matter although there were enough men and the public would favour it. The men who received a technical training easily found employment but a sufficient number of men were not so trained. Hence firms employed a number of untrained men and this he considered was a mistake.

2,244. (*Mr. Cobb.*) The technical classes did not train enough men and they were capable of increasing their output. He was not aware from what sources the students for such classes were drawn, but many young men went direct to the institutions from ordinary schools to learn wiremen's work. Pupils had to pay fees for their training at such classes, and this operated against their free recruitment. Hence he advocated the creation of a school where men could be trained as wiremen for a small fee, such fee being paid back at the conclusion of the course.

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[Continued.]

2,245. (*Mr. Howley.*) The licensing system for wiremen had recently been introduced in Mysore. He asserted that it had been his experience that government was dilatory in according sanction to proposals, and that it sometimes took three or four months to get a proposal sanctioned. He had not actually prepared a statement to support this view, and it was pointed out to him that in twenty-four proposals, selected at random, which had been submitted to government for sanction between the months of March 1915 and August 1916, the average worked out to twenty-three days.

2,246. (*President.*) There were four European firms in Madras who were competent to undertake electrical work, but none of the Indian firms were reliable. The former were not capable of undertaking all the government electrical repair work in Madras and all the work they actually did required close supervision.

2,247. He advocated the establishment in Madras of a government workshop for the repair of electrical articles as it was neither economical nor convenient to have such work done by firms.

At Madras, Monday, 19th February 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

A. T. MACKENZIE, Esq.

SIR NOEL KERSHAW, K.C.B.

C. S. COBB, Esq., M.V.O.

And the following Co-opted Member :—

W. J. J. HOWLEY, Esq., A.M.I.C.E., Superintending Engineer, Public Works Department.

D. G. HARRIS, Esq. (*Secretary*).

G. F. PADDISON, Esq., I.C.S., Collector of Madura.

Written Statement.

2,248. (1.) *Economy and suitability of methods of execution of public works.*—It must be premised to start with that I have very little experience to draw upon for an opinion on the points raised in the Government of India's resolution. Two years in the Agency Tracts where most of the roads and buildings are in charge of the agency officers, ten or eleven years on settlement work and other special duty leave only three years in which I have actually had to deal with the problems, one year as Collector of Anantapur, a poor and backward Telegu district in the Deccan, three months as Collector of Bellary and two years in Madura, a rich and progressive *tehsil* district, containing the great Periyar system of irrigation and the largest *mofussil* city of the presidency. I was also for some months in charge of Bezwada subdivision, the headquarters of the Kistna Delta irrigation.

(2.) One of the main suggestions raised in the resolution, *viz.*, that local bodies should be encouraged to arrange for the execution by their own staff, or by private agency, of works such as buildings and roads had already been put into practice in this presidency. Practically all the roads, bridges, school-buildings, hospitals, dispensaries, drains and other miscellaneous civil works are in charge of local bodies and are erected and maintained by them from their own funds or from government grants for the purpose and this arrangement is in my opinion economical and suitable for the purpose of which it is devised. The exceptions are chiefly government offices and residences and large buildings or other works in municipal towns which require greater technical skill and knowledge than the municipal engineering staff can afford. In this district I would instance the water-works at Periyakulam, Dindigul and Kodaikanal all small municipalities and the hospital in Periyakulam; these municipalities have no engineering staff and someone from outside must do the work or at all events must supervise it. It would not be desirable for the district board engineering staff to do this work, as they have quite enough to do at present, and to lend the services of the officers of one local body to another may give rise to friction and difficulties. As an instance of large schemes in the bigger municipalities, I might mention the drainage works in Madura which are being carried out at an expense of Rs. 20 or 30 lakhs by the Public Works Department, the municipality providing half and the government half of the funds. Here again the work would certainly be beyond the competence of the limited engineering staff at the disposal of the municipality. On the other hand,

very large bridge works are carried out by the district board engineering staff, *e.g.*, the bridges over the Vaigai at Kunnur, the Varahanadhi, the Pambar and the Shanmuganadhi and the causeway at Melakkal across the Vaigai have all been completed in recent years at the cost noted below from district board funds and government grants under the supervision of the district board engineer. The estimates are scrutinized by the Superintending Engineer or high engineering authority in each case and he is always ready to assist with his advice if difficulties arise. I have also received very valuable information and advice on the condition and repair of the roads from the Superintending Engineers after their tours.

	Rs.
Kunnur	64,000
Varahanadhi	72,000
Pambar	38,000
Shanmuganadhi	1,05,000
Melakkal causeway	53,000

(3.) I consider that the present arrangements work very well on the whole. I gather that it is not proposed, nor do I consider it desirable, that the execution and maintenance of government irrigation works should be interfered with in any way. If this be so, in all districts or group of districts it is necessary to maintain a government engineering staff, and this staff can look after the buildings and other works which I have referred to above. If government offices and still more government residences were put in charge of district board agency, there would, I consider, be a great deal of friction. There are complaints now about government bungalows from discontented occupants, but the Public Works Department executive officer, if he is in the right, has the weight of a government department at his back. It would be a different matter for the district board engineer and the president, district board. On the other hand, it is for consideration whether some of the main through communications should not be in the hands of the Public Works Department. For one thing I think that the Public Works Department find less difficulty in procuring the necessary funds. The Kodaikanal Ghaut Road has been constructed by the Public Works Department and it is feared will shortly be handed over to the district board for maintenance. This is only to a small extent a "district" road and is largely used by visitors from all over the southern part of the presidency. I am afraid that the district board will find it almost impossible to provide funds for its proper

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[Continued.]

upkeep and I think that the Chief Engineer would be more likely to be able to persuade government to provide funds than the president, district board. The difficulty of maintaining the through communication is, however, not nearly so great in a place like Madura as in the more backward and unpopular districts like Anantapur. Even in Madura I find considerable difficulty in obtaining a trained Assistant Engineer on Rs. 150 to Rs. 200. In Anantapur it is almost impossible. The engineer who was in charge of Anantapur roads, just before I took charge, built bridges and schools which immediately fell down. His successor was a very competent man, young, keen and intelligent, but, as I feared, he left on promotion in about a year. A provincial department like the Public Works Department, on the other hand, can insist on competent men going to such unpopular places and staying there though even they find that the sickness among relatives entailing immediate leave or a transfer to such a place is remarkable. The district is very poor and yet it is expected to maintain many miles of the main military road from Secunderabad to Bangalore, a road which is perhaps not one of the most important from a district point of view. I consider that works of this kind should be entrusted to the Public Works Department who would give to the work adequate funds and adequate supervision.

2,249. (II.) Encouragement of other agency.—As regards the second main point whether under the existing system private enterprise is sufficiently encouraged, I believe that both the Public Works Department and the local bodies are ready to entrust the execution of work to private contractors in so far as they are available. The two largest works recently completed in this district are the new Collector's office at Madura, recently completed for nearly Rs. 4 lakhs and the ghaut road to Kodaikanal which cost about Rs. 7 lakhs. The execution of the first was originally entrusted to a private English firm, but resulted in a law-suit. This was before my time and the Superintending Engineer who is being examined will be better able to explain the details than I. The work was entirely completed by departmental agency at a cost, I understand, lower than the rates asked for by the private firm although the war had intervened. The result is a magnificent building admirably executed. The ghaut Road to Kodaikanal was carried out by a Muhammadan contractor under the supervision of the Public Works Department and is a very difficult work very well carried out. On the local fund side the maintenance and repair of the roads are almost entirely carried out by small contractors who each take up a few miles of the road.

(2). Tenders are called for after the estimates have been passed by the district and *taluk* boards. Only in out-of-the-way places, where no contractor is willing to come forward, is the work done departmentally. It has been suggested that the whole of the roads of a district or large stretches of them might be entrusted to a private firm who would employ regular gangs of *coolis* and supervise the work, provide steam rollers, tools, plant and so on. There is nothing in the rules against this being done and if contractors were available I think the system would be tried in some districts. I am told that this was done in Malabar, but have not heard whether it was a success. The advantage of contract work is that the private man can often procure labour more easily and has a more personal interest in getting his work done quickly as he wants to turn over his capital as quickly as possible. The difficulty is to find contractors with both capital and business knowledge. I may instance the St. George's Homes, a private institution in this district who proposed to build largely at Kodaikanal, but could not obtain tenders within

25 per cent. of the estimates which had been framed in consultation with the Public Works Department.

(3). I should also mention here the "A" system of contract which is sometimes used in this district. The main principle on which this is based is that it is to the interest of those who use the road to maintain it in good order and to spend money on it of their own. Accordingly, in out-of-the-way places where it is difficult to supervise work departmentally or in other places where the local board cannot afford money to put the road in proper order, the maintenance of a road is handed over to a private party who receives a small but admittedly inadequate grant for the purpose so long as he maintains the road in decent order. This is done in this district in the case of the bridle path from Bodu Mettu on the Travancore Hills to Bodinayakkanur and was started on a road through the Kannivadi *zemindari* in this district, the grant being made over to the manager, an educated Indian in the employ of a Bengal company. This had to be given up as the company lost the title to the *zemindari* in a law-suit. A similar system is in force with the Public Works Department for the road from the foot of the ropeway from the Travancore hills, a grant being made to the Travancore planters for the purpose. A certain number of roads are also maintained very cheaply by the Forest Department and grants are made to them from local funds for the portions of the roads which are useful to the public on the plains.

2,250. (III.) Changes in organization.—I do not consider that any modification of the staff of the Public Works Department is necessary for the present. If at any time private contractors are found ready to undertake a larger share in the execution and maintenance of works, it may be possible to dispense with the services of some of the subordinate staff who would then be available for employment under the contractors and whose knowledge and experience would be of great value. As a small instance of this, I find in the Madura Municipality it was the custom to spread all metal departmentally. This is said to have been slow and inefficient. The *mistri* who formerly did the work departmentally now does a good deal as a petty contractor. Under the stimulus of personal profit, he is said to turn out better and quicker work.

2,251. (IV.) Relations with other departments and sub-branches.—I consider that the Public Works Department adequately meets the needs of the other branches of the administration. I know nothing of the relations *inter se* of the various branches of the Public Works Department.

2,252. (V.) Decentralization and (VI.) Simplification of procedure.—These are departmental matters with which I have no concern.

2,253. (VII.) Education, and (VIII.) Practical training.—With reference to this question I speak with even greater diffidence than on the other matters which I have discussed. I do not know in what the curriculum at the engineering college consists or what is the nature of the practical training which is given there. I should, however, say that speaking generally the applicants for the posts of local fund Assistant Engineers, however brilliant their qualifications, have not enough experience of practical work in connection with roads, bridges and buildings. Not seldom candidates receive such practical training at our expense and then leave with a view to better their prospects just when they are becoming useful. What is wanted is a man who can check and supervise subordinates or contractors, extract work from them and gain their confidence. This can only be done by a man who can actually do the work himself, and it is to gain this end that I would like to see the practical training of our future local fund engineers devoted.

MR. G. F. PADDISON called and examined.

2,254. (President.) The witness stated that he was a Collector of three years standing in the Madras Presidency.

2,255. Each district board employed an engineer and Assistant Engineer. The appointment of the former was not pensionable, but its incumbent subscribed towards

a provident fund. Endeavour was being made to create a regular cadre for district board engineers as a whole and to regulate promotion thereby and the boards had been asked to forward expressions of their views in this connection. A seniority list has also been circulated

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[Continued.]

to the boards with the request that the senior man in the list might be selected on the occurrence of a vacancy but no definite conclusions had been arrived at, and the whole subject was in an incipient stage.

2,256. District engineers were appointed on the approval by government of the nomination made by the president of the board, and the members of the district board were not concerned with such nomination. Candidates were required to possess certain engineering qualifications, but these were not always insisted upon. He had known cases in which certain inefficient men had been recommended for such appointments, and the president had been requested by government to make another selection if men with the requisite qualifications were available.

2,257. The president of a district board could dismiss an incompetent district engineer but an appeal against such a decision had to be submitted to government through the members of the district board.

2,258. Estimates in excess of a certain amount required the approval of the Superintending Engineer prior to their being sanctioned by the district board and provision had to be made for all estimates in the budget subject to the general approval of government. For instance, if a district board decided to build a bridge the estimated cost of which was Rs. 50,000 a resolution in its favour would have to be passed by the member in whom the power to accord sanction to estimates was vested. An allowance for it would then be made in the budget and the estimate forwarded to the Superintending Engineer for scrutiny after which the board sanctioned it with the modifications, if any, suggested by that officer. He added that district boards possessed certain powers of reappropriation in the matter of the construction of non-budget works, but he did not think they could reappropriate money provided for hospitals for utilization on roads.

2,259. He had never known of a case in which government had attempted to interfere in connection with projects for the construction of roads and did not think that they could negative a resolution passed by a district board sanctioning the construction of a road the estimated cost of which was Rs. 50,000 as he believed that they had no statutory powers to negative a particular resolution passed by a district board. He was not quite certain whether government had the power to insist on the construction of a bridge by a district board, if the latter were opposed to such construction and did not think government had the power to supersede a district board in the event of its having neglected its duties.

2,260. Each district was sub-divided into a number of *taluks* each of which submitted estimates for public works in excess of Rs. 2,500 to the district board to whom they were subordinate for sanction.

2,261. *Taluk* boards did not maintain a separate engineering staff of their own, but the question of their doing so was under consideration. At present district boards employed a district and an Assistant Engineer, but the jurisdiction of the latter was not coterminous with that of the *taluk* boards. In the Madura district, one engineer was in charge of slightly more than two *taluks*.

2,262. The approval of the Superintending Engineer to district board estimates in excess of a certain amount was purely of a professional nature. For instance, that officer could not advise as to the necessity for a work, as he was only required to examine estimates from a technical standpoint. He did not think government charged a percentage for such professional advice.

2,263. The Executive Engineer was, as a rule, a nominated member of the district board and did not inspect district board works but it was open to the Superintending Engineer, in the course of his tours, to do so and to report on their condition, and he knew of a case, that of the construction of a bridge the estimated cost of which was Rs. 1,00,000, where that officer had advised on a technical difficulty. The Superintending Engineer was required to submit confidential reports to government, through the president of the board, on the work of district board engineers but he had no statutory powers whatever as an inspector of district board works and could

not enforce any of his recommendations, except those in regard to the modification of estimates, because his duties were purely advisory.

2,264. The pay of district board Assistant Engineers averaged about Rs. 250 a month; that of overseers Rs. 80 to Rs. 100 and of sub-overseers about Rs. 60 a month. The Madura District Board was a large one and it had constructed several large bridges within its jurisdiction.

2,265. A large proportion of the expenditure on district board works had, in the past, been met by government. For instance, if a district board was prepared to provide half the cost of the construction of a particular building it would usually apply to government for a grant-in-aid of the balance and this request was generally acceded to. As a rule the construction of a large bridge was beyond the resources of a district board and had to be erected by means of a special grant obtained from government.

2,266. After estimates of works had been approved by the Superintending Engineer and sanctioned by the board, the contracts therefor were given out by the president of the board in consultation with the district engineer and the members of the district board were not concerned in the matter.

2,267. The district board of Madura had charge of practically all the roads in their jurisdiction with the exception of the Kodaikanal Ghaut Road and the road leading to Travancore, and roads involving technical difficulties in their construction were constructed by the Public Works Department and occasionally handed over to the district board after completion, for maintenance. The two roads he had referred to were zig-zag ghaut roads which required special engineering skill, and the Public Works Department maintained them on account of their special nature although the district board had subscribed towards the cost of their construction. The district board was not anxious to take over the maintenance of the two roads, partly on account of the large expenditure that was required for their maintenance and partly because of the technical difficulties involved. In the circumstances he was of opinion that it was preferable to entrust the two roads to the Public Works Department, particularly as it could more easily obtain a larger maintenance grant than the district board.

2,268. From his experience of the roads in the Madura district he thought they were efficiently maintained but added that the standard of maintenance depended largely on the personality of the district engineer. Larger grants were allotted for main communications maintained by the district board than for *taluk* board roads which affected purely local interests; hence the *taluk* boards invariably urged that they could not maintain their communications to the required standard owing to the insufficiency of their grants. He attributed the variations in the condition of the roads of the several districts to the varied degrees of competency of the engineering establishments and to the grants allotted for their maintenance and explained that the sum available for the purpose was in proportion to the land cess, which latter was based on the amount of wet land in a district. In his opinion this system was disadvantageous in the Anantapur district which was poor in wet lands, though it was advantageous in the Madura district because of its possessing large irrigated areas, and he explained that the theory on which the cess had been based was that the smaller irrigated areas had less traffic. He drew attention to the fact that the Anantapur District Board was required to maintain a military road which traversed it, and recommended that its maintenance should be undertaken by government on account of its being a purely military communication.

2,269. The grant made by government to district boards was in proportion to the amount of their general revenue, i.e., their land cess, but the district of Malabar had recently levied a higher cess and received a correspondingly larger grant from government, thus giving rise to complaints by other district boards. In addition to the annual grant government provided half the cost of special works constructed in a district.

2,270. By "government" in his suggestion that government should maintain military roads in a district,

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he meant government in the Public Works Department. He thought that the maintenance of military communications by district boards subject to the provision by government of grants equivalent to their average cost of maintenance would not adequately meet the requirements, because he anticipated that the boards would not be able to secure as large an appropriation for the purpose as the Public Works Department. A further drawback was that district board subordinates could not be compelled to stay at unpopular places such as Anantapur, whereas the Public Works Department could post their subordinates wherever they chose.

2,271. The district board of Madura was responsible for the construction of all works pertaining to its own requirements, but had no connection with the construction and maintenance of government buildings. He did not approve of the suggestion that the latter class of work should be transferred to district boards in the same way as roads had been made over to them, because although extra grants of money would be given for the purpose, it would entail heavier work, and open the door to allegations of unsatisfactory work which would be more difficult for the boards to meet than for the Public Works Department. He did not think the presidents of district boards would welcome the change as it would add considerably to the duties of the board and the district engineer; the time of the latter was already fully occupied. In his opinion if work was to be transferred to district boards, both buildings and irrigation works should be handed over, and not only one of the heads. He admitted, however, that irrigation works, consisting as they did mainly of tanks, were necessarily very scattered, and that it would be impossible to concentrate a government staff even in a particular locality leaving the remainder to the district board for maintenance.

2,272. Practically all the police buildings in the Madras Presidency were government property. Police lines and offices were formerly constructed by the Police Department, but they were now erected by the Public Works Department.

2,273. Madura was a fairly large town with a population of 150,000 to 200,000 and its municipality employed an engineer on Rs. 300 a month and a few overseers. The construction of municipal drainage and water-works was carried out by the Public Works Department, on account of the deficiency and inefficiency of the municipal staff, and handed over, after their completion, to the municipality for maintenance. A large drainage scheme was at present under construction at Madura by the Public Works Department and its estimated cost was Rs. 7,00,000. There were four small municipalities in the Madura district, namely, Dindigul, Periyakulam, Kodaikanal and Bodinayakanur, all of which employed a small engineering establishment for the construction of schools and hospitals. The large hospital at Dindigul had been constructed by government agency, and the hospital at Periyakulam was being rebuilt by government as the municipal staff were inadequate for the purpose. In his opinion, it was not possible for municipalities to extend their sphere of work. The Madura district board would have to employ a larger engineering staff when the Madura drainage works were completed, but small municipalities having a population of about 10,000 to 15,000 inhabitants could not afford to take up such maintenance work. It would not repay municipalities to employ an engineering staff of their own for the construction of their few large works, nor would it be possible for a number of municipalities to combine with the object of employing a permanent engineering staff between them for the purpose as such an arrangement would inevitably lead to friction.

2,274. He was responsible for the maintenance of a large number of minor irrigation works for which he employed a special establishment consisting of a supervisor and a certain number of overseers and sub-overseers, and this staff was separate from that of the Public Works Department. The minor, like the major irrigation works, were scattered all over the district, and the former were under the control of the Collector because they

required comparatively very little professional attention. The *tehsildars*, he thought, had greater influence over *raiyyats* than the Public Works Department and could obtain more work out of them. Certain repairs to minor irrigation tanks were carried out by the *raiyyats* themselves but the removal of jungly growth was generally done by the people of the district, without remuneration. Certain minor repairs to major irrigation tanks were also executed by the same agency.

2,275. There were three independent Public Works establishments in the Madura district all working within the same area and performing identical duties, viz., a Public Works Department staff which was responsible for irrigation major works and all government buildings, a district board establishment which was entrusted with the construction and maintenance of certain roads and buildings within its jurisdiction, and a minor irrigation staff under the Collector, which was responsible for minor irrigation works. The position was anomalous and led to redundancy in the supervisory establishment but he had not considered the question of the simplification of the present procedure in its relation to irrigation works. He was emphatically opposed to the transfer to district boards of all the scattered irrigation works with the exception of the larger canal projects, subject to the provision by government of funds for their maintenance, because the responsibility for them would devolve on Collectors of districts, by virtue of the fact that they were presidents of the district boards, and these officers were already overburdened with work. He was also not in favour of the converse proposal, viz., that all the roads and building work in districts should be transferred to the Public Works Department, with a view to the reduction, wherever possible, of the three staffs at present engaged. In his opinion the district board was concerned only with its own roads and buildings, and there was no good reason why it should be burdened with government work.

2,276. District boards evinced no interest in the maintenance of their irrigation tanks as the revenue derived therefrom was credited to government, but he considered that they might do so if they were paid a percentage of the revenue collected in their respective jurisdictions.

2,277. There had been a marked improvement during the past ten or fifteen years in the amount of interest taken by members in the work of district boards.

2,278. As far as he was aware, a resolution had been proposed in the Madras Legislative Council in favour of the appointment of non-official presidents of district boards, but this had not yet received the approval of government.

2,279. *Taluk* boards were subordinate to district boards, and some districts had non-official vice presidents. The work of district boards was not conducted by a secretary. The president was virtually the administrative officer and he received the assistance of the vice president. The office of a district board was housed in the same building as that of the Collector, but there was no reason why it should not be located elsewhere. He could not suggest improvements for the execution of public works in his district, and considered that the present system did not require any change except that *taluk* boards might be allowed to employ Assistant Engineers. In support of his recommendation he stated that *taluk* boards at present constructed a large number of schools, hospitals, and minor roads under the general direction of the district engineer and that they had no qualified officer under their control, who was responsible for their execution. *Taluk* and district board roads were, comparatively speaking, analogous to major and minor irrigation works, and he did not think it would lead to a material improvement if the latter works were re-transferred to the Public Works Department. In his opinion, both the district board and the Public Works Department establishments were needed in a district but he admitted that such a system was not economical and could not suggest any efficacious remedy.

2,280. (Sir Noel Kershaw.) District board estimates, in excess of a certain sum, including the plans therefor, required the approval of the Superintending Engineer.

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2,281. The Public Works Department maintained its roads in a better condition than the district board, but for the encouragement of local self-government and in view of the local interest evinced in roads, he thought it would be advantageous if they were under the control of district boards, particularly as the difference in the respective cost of their maintenance, by the two agencies, was slight.

2,282. He admitted that the existence, in the same area, of the district board and Public Works Department establishment was uneconomical to a limited extent, but was of opinion that the district board could not take over any government work with the exception of a few irrigation works, in which event, however, they would not be so well maintained. The district board would not be keen on taking over the construction and repair of government buildings unless it was made worth their while, but on the assumption that they did accept a limited number, he did not think that the members of the board would look upon such a transfer as the prelude to the eventual transfer to them of a larger number of works, nor did he think that such a prospect would appeal to them.

2,283. (*Mr. Mackenzie.*) He was not aware of the actual number of minor irrigation works in the district as compared with that of major works, but thought that the percentage would perhaps be fifty to one.

2,284. The question of the supervision of tanks was governed more by their accessibility than by their magnitude and *tehsildars* had more frequent opportunities of inspecting works than Executive Engineers. The latter fact might perhaps have been one of the reasons why minor irrigation works had been entrusted to the Revenue Department. The Collector was vitally interested in irrigation major works, although they were under the charge of the Public Works Department, because they created revenue and prosperity in a district. It would be a step in the right direction to gradually entrust district boards with the collection of revenue, but if major works were transferred to district boards, the Executive Engineer would suffer from the handicap that he would be subordinate to the Collector as president of the district board and its members as well as to the Collector in his official capacity as a government servant. In regard to the subordination of the Executive Engineer of the Public Works Department to the Collector he stated that the present arrangement was satisfactory and that he had no cause for complaint. He, as head of the district, would naturally prefer to exercise entire control over the district, but the question had been discussed some years ago by the Collectors' conference and it had been decided that the existing arrangement for the execution of public works, in its relation to the Collector, did not call for any modification.

2,285. He favoured the system in vogue in certain parts of Southern India, which was a minor form of local self-government, under which major and minor irrigation tanks were handed over for maintenance to *dust-bunders* on the understanding that they would be entitled to receive 10 per cent. of the revenue derived therefrom, and expressed the view that it would be advantageous if the local boards made over to their members certain portions of revenue derived from tanks for their maintenance. The district engineering staff were not, as a rule, capable of maintaining major works and an increase in their emoluments would not affect the position.

2,286. The principal work of municipalities was the maintenance of roads, and construction of buildings. He could not say what number of men were actually employed on these two classes of municipal work, but thought that the pay of the Municipal Engineer, Madura, should be largely increased. Material progress in India demanded the expansion of municipal engineering work and the entertainment of a more highly-skilled engineering staff for supervision, but he doubted whether smaller

municipalities with their slender resources could keep pace with the times.

2,287. About 80 per cent. of the engineering subordinates of district and *taluk* boards were *Brahmins*, and this made it difficult to secure men for inaccessible places as they naturally gravitated to stations where there were numerous men of their own caste. To overcome the difficulty he suggested the encouragement of sub-overseers of lower caste by the reduction of the educational standard.

2,288. (*Mr. Cobb.*) The Superintending Engineer scrutinised estimates for minor irrigation works in excess of Rs. 2,500 but these estimates were very few and far between. In fact, only one such estimate had been submitted to the Superintending Engineer during his tenure of the office of Collector of Madura.

2,289. (*President.*) The repair of a serious breach in a minor irrigation tank would be undertaken by his staff.

2,290. Minor irrigation works were, he presumed, originally under the control of the Public Works Department and he thought that the dual system of supervision which was at present in vogue for minor and major irrigation tanks originated owing to the fact that it had proved to be more economical and to the time which was occupied by an Executive Engineer in touring all over his district.

2,291. (*Mr. Cobb.*) A marked improvement had recently taken place in the amount of interest evinced by members of district boards in their work.

2,292. The district board budget was framed by a committee specially convened for the purpose, on which the *taluk* boards were represented. The committee decided as to the distribution of the resources as between the several works contemplated, and laid the result of their discussions before the board, who did not embark on a lengthy discussion of the details though modifications were sometimes made owing to members considering the interests of certain areas had been overlooked. The final recommendations of the board were then forwarded to government who, as a rule, accepted the proposals.

2,293. (*Mr. Howley.*) The district engineer was appointed by the president with the approval of government and the district board members were not concerned with his appointment. The other engineering staff were, he understood, under the orders of the president in the matter of punishment, but not as regards appointment. He was not certain what authority could dismiss a district engineer, but if the president punished a subordinate he would have a right of appeal to the board.

2,294. The discussion of the budget sub-committee in connection with the allocation of funds for the ensuing year was practically equivalent to administrative sanction, and when the several allotments had been sanctioned in the budget the technical estimates for buildings were submitted to the board for sanction and such estimates were merely subjected to a check as regards rates before sanction to them was accorded.

2,295. Though the district board would not object to handing over a few of their principal roads to the Public Works Department they would not welcome the transfer of all their roads to that Department.

2,296. (*President.*) The repairs to minor irrigation works were executed by *tehsildars* subject to the advice of the district engineering staff, and in such cases the estimates were prepared by the latter agency and checked by the former.

2,297. Repair work was usually entrusted to contractors and supervised by the engineering staff. The relative position of the overseer to the *tehsildar* was analogous to that of a district engineer to the president of the district board.

2,298. He had had no experience of the conditions in any other part of India, outside the Madras Presidency, except Poona, where he had been on deputation in connection with the Forest Committee.

C. S. SCHMIDT, Esq., District Board Engineer, Madura.

Written Statement.

2,299. (L.) Economy and suitability of methods of execution of public works.—The methods adopted

at present are satisfactory although not economical; for instance taking a district in the Madras Presidency (1) there are Superintending Engineers, Executive

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Engineers, Assistant Engineers or sub-engineers, supervisors, overseers and sub-overseers and *mistris* under the Public Works Department; while under the district board, there are district engineers, Assistant Engineers, overseers and sub-overseers. The ranges of the officers of the two departments are generally common and therefore by bringing both the buildings and roads under one head there will be economy.

2,300. (II.) **Encouragement of other agency.**—Private enterprise is sufficiently encouraged, but defective owing to want of education. It may be possible to entrust the construction of large buildings requiring technical skill and costing more than Rs. 75,000 to firms, but I do not think it will be economical. The firms will require exorbitant rates without any corresponding advantage in the way of giving instruction to the local engineers and subordinates. These firms usually employ highly paid engineers from the continent, and use expensive machinery for works which naturally increase their cost, and consequently it will not be paying to them unless they are paid about 10 or 15 per cent. above our usual estimate rates. I suggest therefore what, in my opinion, is the most economical and effective method of carrying out the works which will suit the present condition and will give instruction and stimulus to activity on the part of local engineers. I would divide a large building or project work into several items such as, (1) foundation, (2) superstructure, (3) wood-work, (4) iron-work, (5) painting, etc., and entrust each of these to private contractors who have under them passed engineers and subordinates or to contractors who are themselves such. This system will give scope for many contractors and thus encourage healthy competition and will give opportunity for them to specialize in each of these items. This automatically will be an incentive to industrial enterprise in other directions also. I have in my next suggestion recommended the removal or reduction of the subordinate staff in the Public Works Department; this proposal allows a good opening for entertaining them. The students, in this method, will not depend for their employment solely on government service and will, of necessity, have to spend their time usefully in their own instruction so that their employment may be profitable to contractors. In case they themselves desire to become contractors the necessity for instruction is all the greater and they cannot afford to lose the opportunity of receiving instruction thinking that they could procure some post or other under government. It will be sufficient if these contractors are allowed the 5 per cent. usually allowed in estimates for supervision to compensate them for entertaining passed men. Works under Rs. 75,000 may be constructed and maintained by the district boards.

2,301. (III.) **Changes in organization.**—Modification of the staff is necessary. Owing to the entrusting of the construction and upkeep of buildings up to Rs. 75,000

to the district boards, the Public Works Department staff may be reduced to a Chief Engineer and Secretary to Government, a Deputy Chief Engineer to be in charge of the technical branch for the preparation of designs, a Consulting Architect, an Electrical Engineer and a Sanitary Engineer for the presidency, an Executive Engineer for one or more districts according to the number of major works to be constructed in each year and Assistant Engineers to assist them.

(2). The district board will have a district engineer with a personal assistant, Assistant Engineers, overseers, sub-overseers and *mistris*. Of course the status and qualifications of the district board engineer should be that corresponding with the Executive Engineers of the Public Works Department, and an Indian-trained engineer should have at least 10 to 12 years service as an Assistant Engineer, or equivalent, before he can be put in charge of a district, and the status of the subordinates improved correspondingly.

2,302. (IV.) **Relations with other departments and sub-branches.**—As there are special engineers concentrated in the Chief Engineer's office for these various branches, no further special department is necessary.

2,303. (V.) **Decentralization.**—The Executive Engineers who are the direct subordinates of the Chief Engineer may be entrusted with the powers now exercised by Superintending Engineers.

2,304. (VI.) **Simplification of procedure.**—Necessary alterations to suit the above proposals may have to be made in the Code.

2,305. (VII.) **Education.**—The theoretical education given in the college is fairly satisfactory, but may be improved by inviting special experts in the various branches such as sanitary, electrical, marine, and mining engineering, to deliver a course of lectures to the students in place of some of the subjects which may be deleted such as chemistry, heat, and the vernaculars, as sufficient knowledge of these is obtained during their school course.

2,306. (VIII.) **Practical training.**—Both the recruits from the English and the Indian colleges may be given two years' practical training—six months under the Chief Engineer in the preparation of designs, six months on building works, six months on sanitary works and the remaining period on irrigation works during which periods they should be given proper training by placing them in places of some responsibility and made to work in the same way as paid men.

2,307. (*General.*) Finally, I desire to offer some suggestions on the Irrigation Branch so as to make my proposals complete. Here also I would divide it into two heads: (1) completed projects and investigations and construction of works over Rs. 75,000 under the Public Works Department, and (2) minor irrigation tanks, etc., under the district boards.

MR. C. S. SCHMIDT called and examined.

2,308. (*President.*) The witness stated that he was the district board engineer of Madura and that he had had 12 years' service on railways and 16 years' service with district boards. His knowledge of engineering work had been acquired in the school of practical experience. He had therefore not attended an engineering college and consequently possessed no recognised diplomas.

2,309. The appointment of district engineer was made by the president of the board subject to the approval of government. The power of dismissal of such an officer, he thought, also rested with the president of the board, and was also subject to the approval of government. The procedure in such cases was for the president to pass orders and place his final decision before the board, and he knew of two cases which had been disposed of in this manner. Both the cases were productive of an appeal to government, but government rarely, if ever, interfered.

2,310. His average annual expenditure on works for the last four years had been about Rs. 5,00,000 and these works consisted of roads, buildings, sanitation, schools

and hospitals. He added that of the sum of Rs. 5,00,000 about Rs. 2,00,000 were spent in equal proportions, on public works buildings and roads.

2,311. The percentage that the cost of the establishment in his district bore to the cost of works was about 10 or 11 per cent., but that figure included only the cost of the permanent staff and not that of the temporary works establishment. He had not had any experience of the percentage rate in other district boards.

2,312. He was required to submit estimates for buildings to the Superintending Engineer for professional approval if they exceeded Rs. 2,500 but no limit had been fixed for expenditure on roads and the district board were competent to sanction road estimates irrespective of the amount of the expenditure involved. In the case of a bridge, however, the limit of Rs. 2,500 applied.

2,313. The Superintending Engineer could inspect district board works while in progress if he chose to do so, and it had been ruled that he should inspect such works when passing through the district on a tour of

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inspection and write an inspection note on the points he had noticed. These instructions were fully complied with and the Superintending Engineer was informed when this had been done. He could not refuse to comply with any alterations or suggestions made by the Superintending Engineer in his inspection note unless he could furnish good reasons for doing so.

2,314. Works in his district were executed by contract and tenders for entire projects were invariably invited both for the district, as well as the *taluk* board works, except in the case of bridges when it was optional to the engineer to decide whether one or more contractors should be employed. Personally, he preferred to employ one contractor for large works and to entrust the steel-work to a firm recognised by government. Materials were very rarely supplied by the Madura District Board to the contractors they engaged, but, if a particular class of materials such as cement was required for a large work, he preferred to buy the cement himself and supply it to the contractor. His reason for this was that contractors did not, as a rule, obtain suitable cement, and it was not possible for the engineer to effect constant supervision. He preferred the practice of supplying cement to contractors even if a particular class of cement were specified in the contract, unless there was very good supervision. Lump sum tenders were not called for but tenders on a percentage above or below current rates.

2,315. For the past five or six years the rates of the Madura District Board had been practically the same as those of the Public Works Department. The schedule of rates in use by the board was approved by the Superintending Engineer after due scrutiny. The board's estimates were generally pitched at about 2 to 5 per cent. in excess of the scheduled rate in order to provide for supervision and contingent charges, but each individual rate contained an allowance for the contractor's profit. For example, if the rate for concrete worked up to about Rs. 14 per cent. cubic feet, a rupee was added and the rate fixed at Rs. 15 per cent. cubic feet to meet the contractor's profit. In this manner a contractor received a small profit on each item of work.

2,316. The suggestion in his written statement that private enterprise might be encouraged to a larger extent by the giving out of piece-meal estimates was, he explained, made with the object of ensuring specialization. At present an entire project was entrusted to a single contractor, who perhaps might only be an ironmonger and thus have no knowledge of masonry.

2,317. He suggested that the present duplication of staff caused by the presence in the districts of a Public Works Department and district board staff could be obviated by the transfer to local boards of all buildings costing less than Rs. 75,000 for construction and maintenance and met the contention that district boards might not welcome such a transfer owing to their disinterestedness in government buildings with the remark that it rested with government to compel the boards to accept this additional work, and that from his personal experience he did not anticipate opposition, provided the boards were given a grant-in-aid by government to cover the cost, including a percentage rate on account of supervision. As the transfer would necessitate the employment of a larger staff by the district board to cope with the additional work he did not think any practical difficulties would arise. Nor did he anticipate any friction consequent on the head of a department utilizing the services of the district engineer simultaneously with the district board, and thus giving cause for the complaint that the district engineer showed more concern for government buildings than his own legitimate work. He emphasized that work ought to be centralized by being entrusted to one agency, whether such agency was to be the Public Works Department or the district boards, thus securing greater economy.

2,318. District boards, in his opinion, would gladly take over the maintenance of all minor irrigation works in the presidency from the Collectors, who at present maintained these works with the aid of the local revenue

men under a supervisory overseer, in spite of the fact that the revenue derived from such works was credited to the government treasury.

2,319. He did not agree with the suggestion that the Public Works Department Irrigation Branch should be entrusted with the care of government buildings inasmuch as the additional charge would cause practically no extra expense owing to its establishment being already employed in the districts, and stated that the main difficulty which had been experienced in supervising the repairs to government buildings was due to the fact that they were often situated in places where there were no irrigation works, and thus necessitated special arrangements being made for their repair. He added that it was not always the case, as was contended, that the Public Works Department staff had to travel all over the district to supervise its irrigation works, and expressed the opinion that there were no irrigation works under this staff in the major portion of the Madras Presidency, and that the majority of government buildings were thus really situated in inaccessible places. He modified his latter assertion with the admission that small tanks were scattered all over the district, but adhered to his view that large irrigation works were confined to particular areas.

2,320. (*Mr. Cobb.*) The minor irrigation works which were spread over the district were not in the charge of the Public Works Department, but in that of the Collector, who carried out the work with the aid of the local *tehsildar* and a supervisor. The Public Works Department supervised the irrigation major works which were, he believed, few, not only in his own particular district but also in the whole presidency. He added that he had served in three districts of the Madras Presidency. The Public Works Department had charge of the Periyar system of irrigation in the Madura district and also certain large tanks, as to the number of which he was uncertain. Under the present arrangement the staff which supervised the irrigation work were not responsible for the maintenance of the tanks as a special establishment under an Executive Engineer, whose headquarters were at Trichinopoly, had charge of the tanks in the Madura and certain other districts. He stated that the Public Works Department would require a very much smaller staff to maintain their irrigation major works if the maintenance of buildings were taken away from it, but was unable to say whether the present staff could be reduced to the extent of one half.

2,321. The prospects of district contractors were good and several tenders for works under his board were submitted when called for. He added that if contractors engaged for road work in a particular year performed their work satisfactorily, it was customary to re-engage them in the following year. Though tenders were invited for each work, precedence was given to men who had previously given satisfaction.

2,322. In his opinion, the majority of district board members were not anxious to have more work thrust on them. He did not think they were interested even in their present work, and added that out of a board of about twenty members, probably only about five evinced any interest in public works. Hence a great deal of responsibility devolved on the district engineer and chairman of the board. His statement was based on his personal experiences, and he did not agree with the view put forward in evidence that there had been a rapid improvement in the interest displayed by district board members in public works. He added that the majority of the members accepted seats on the board merely for the honour they received, and that they never did any useful work at the board's meetings. He even believed that some of them were not cognisant of the proceedings of meetings, and that perhaps about five only studied the budget proposals.

2,323. (*Sir Noel Kershaw.*) He had never tried splitting up contracts by engaging separate contractors for the sub-heads of work in a building, and remarked that the system was open to the objection that failure on the part of one contractor might entail considerable loss to another. For instance, if the foundations put in by one

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contractor were found faulty another contractor, whose work was right, would lose and hence there might be difficulties.

2,324. He adhered to the statement in his written evidence that large private firms usually employed highly paid engineers and used expensive machinery which, though useful in a way, were in other respects a waste, and explained that the importation of such machinery was made under the erroneous impression that such a procedure would prove profitable, but the firms found from actual experience that such was not the case. In his opinion, firms generally lost by entertaining great ideas.

2,325. The Madura District Board's permanent establishment charges amounted to between 10 and 11 per cent., inclusive of contingencies and supervisory establishment. The amount added for the supervision exercised by *mistris* and overseers was $2\frac{1}{2}$ per cent., and hence the total establishment charges amounted to 13 or 14 per cent.

2,326. (Mr. Howley.) He stated that the Executive Engineer who was stationed in Trichinopoly and who was responsible for the maintenance of large tanks in the Madura district, was primarily employed in connection with the Tank Restoration Scheme, and was informed that this officer had no connection with the maintenance of these tanks, but was employed purely on investigation work. He replied that he did not know what the duties of that officer were, but that he met the latter very often. (Mr. Howley here explained that there was in the Madras Presidency a Tank Restoration division, engaged solely in investigating old tanks which from time to time had been ruined, and added that the staff had no connection with the maintenance and execution of irrigation works.)

2,327. He admitted that there were a good many tanks, in the charge of the Public Works Department,

scattered over the districts of the presidency, and that there were also a good many railway-affected tanks, i.e., tanks that were liable to damage a railway, if breached, but on being informed that tanks had to be inspected at least once a year by the Executive Engineer and sub-divisional officer he stated that he was not aware of the rules on the subject.

2,328. He explained that the 10 or 11 per cent. establishment charges referred to previously included also the cost of the temporary establishment sanctioned from time to time for works, and that this establishment was distinct from the temporary "works establishment."

2,329. For lengths of road less than a mile patch-repair work was done departmentally, but if spreading of metal was necessary for lengths of over a mile the work was given out on contract by mile lengths. For patch-repair work the district board employed a *mistris* for every 10 miles of road and a gang of *coolis*, and except on the two or three main roads in the district, such *mistris* were employed only for four or five months in each year. *Mistris* employed on main roads were engaged for seven months in each year. The remaining months were devoted to the collection of road metal. The Madura District Board did not employ permanent road-gangs as it was not in a position to do so.

2,330. The appointment of district engineer was not a pensionable one, and this officer contributed towards a provident fund. With the exception of men who were recruited a considerable number of years ago, and who were on a pensionable basis, all the engineering staff in his district also subscribed towards a provident fund. The engineering staff employed by the Madura District Board, exclusive of his own appointment, consisted of 3 Assistant Engineers on Rs. 150—250, 2 overseers on Rs. 100, about 7 sub-overseers (one for each *taluk*) on Rs. 40—60—75, besides temporary establishment which was engaged from time to time for the execution of special work.

M. R. RY. V. GOPALA AYYAR AVL, District Board Engineer, Guntur.

Written Statement.

2,331. (I.) Economy and suitability of methods of execution of public works, and (II.) Encouragement of other agency.—The methods at present adopted by the Public Works Department for the execution of civil works are in one of the two ways noted below;—

(a) by contract agency (under Public Works Department supervision) selected after inviting tenders;

(b) by departmental system under closer supervision of the departmental staff.

The latter agency is employed generally only when the former agency is not available, either on account of the rates not being paying or on account of contractors with the necessary knowledge of materials and labour not being available. I am of opinion that the works are being executed as economically as possible.

(2). If by the term "private enterprise" is meant the large contracting and engineering firms as exist in the rich countries of Europe and other continents, such firms do not exist in this presidency except probably in the presidency town. There is no scope for them here. The country is poor; and is mainly agricultural. There are no private works on which they can depend. They will have to rely solely on government works, which will be scattered throughout the presidency. As such firms will have to employ a costly agency government will have to pay at considerably higher rates for the works. If economy were the object, the encouragement of such firms cannot achieve it.

(3). The rates of the Public Works Department leave very little margin for profit. It is only those contractors who have local knowledge of materials and labour, and who can at the same time pay personal attention to the work, that are able to eke out their existence as contractors. Such men are not available now even in many *taluk* centres. This local contracting

agency can be developed, if technical education is encouraged by starting more engineering schools to train lower subordinates.

(4). It is only in cases where such contractors are not available that the departmental system of work is generally resorted to. The work done under this system is no doubt better in quality than what is turned out by the contract system. But I am not in a position to state if any and what extra expenditure is incurred on account of closer supervision, and whether there are any corresponding savings on work. In case there is any extra expenditure on account of departmental work, private enterprise of local contractors may be developed. In many places, there are not even trained artisans. Capable men for purposes of petty supervision it is also difficult to get. I would suggest the opening of technical schools and artisans' classes, one in each district, and of engineering schools to train lower subordinates at least one in each Public Works Department circle. I would prefer the latter schools to be in charge of the Public Works Department. There will be no necessity then to train lower subordinates in the engineering college at Madras.

(5). The Public Works agency now employed by local boards is no doubt a well-trained one, as the district board engineers and their assistants are now being mostly recruited from passed engineers of the Madras college. The execution of works may be entrusted to that agency. But the subordinate staff of overseers and sub-overseers may require improving and strengthening in case the importance and magnitude of the work are such as cannot be managed by them, who are mostly recruited from lower subordinates. Passed upper subordinates have at present no prospects in the local fund, as they cannot hope to get more than Rs. 100 while in the Public Works Department they can rise up to Rs. 500 as sub-engineers, 1st grade. If they are made eligible for the post of local fund Assistant Engineers

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after 10 years' approved service, upper subordinates will enter the local fund service as overseers.

(6). The methods at present adopted are as economical as possible. If further economy were desired, the only way to attain it seems to be by reducing the expenditure under establishment. This may to a certain extent be attained by entrusting the civil works to local boards, agency for execution. But another fact has to be considered in this connection. Though the Chief Engineers for irrigation and buildings are separate, the whole staff from Superintending Engineer downwards are at present looking after irrigation works as well as buildings. Even if the building works are entrusted to other agency, there will still be required some staff to look after the irrigation works. It is therefore a matter for consideration whether the savings effected by reduction of staff consequent on the handing over of civil works to the local boards will be material, seeing that the local boards will also have to be paid some percentage on the works entrusted to them.

2,332. (III.) Changes in organization.—Both the imperial and provincial engineers were getting the same scale of pay till about 1896. The reduced scale of pay for the latter came into force subsequently. If economy were the object, it can, I think, be effected by increasing the number of provincial engineers to three-fourths of the total number or more and abolishing or reducing the imperial engineers and getting special men with special salaries for doing special work. The present proportion of provincial engineers seems to be only about one-third.

2,333. (VII.) Education, and (VIII.) Practical training.—There is at present only one appointment of Assistant Engineer in the Public Works Department that is guaranteed to the passed engineers of the college. Assistant Engineers' places under the local boards are open to them, but the number depends on the vacancies that may occur. Railway engineers' places are practically closed to the Indians. There are no other private employments available. All except the one lucky man have to enter the Public Works Department as temporary upper subordinates, and their position is not very much better than that of passed upper subordinates. If this were the prospect after five years' professional training, the college cannot attract the best men available. Only one or two of the best men who can hope for the guaranteed place come in. There are the other professions, such as law and medicine, where capable men can thrive better. If the best men are to be attracted, better prospects should be held out.

(2). Secondly, admission is not regulated by the results of any entrance examination in which the subjects useful for the course play any part. It is now purely a matter of selection.

(3). Thirdly, the examination is conducted by the college staff and not by an independent board of examiners. The appointment is not given to the man who comes first in the examination. In several years, the men taking up mechanical engineering and passing out as mechanical engineers have been selected. This is an anomalous arrangement as an Assistant Engineer in the Public Works Department is concerned almost entirely with civil engineering. These minor defects also have to be remedied, if the college is to attract the best men.

(4). The curriculum of studies in the Madras college is as high as that of other colleges on the continent. But the system of instruction requires modification.

(5). The college course was originally 2 years (only theoretical). It was subsequently increased to 5 years, 3 years theoretical and 2 practical. The practical was afterwards reduced to one year, making a total of four

years. The theoretical course is now increased from 3 to 4 years, the practical course being 1 year, making a total of 5 years. I think the theoretical course can be reduced to 3 years and that the practical course should be increased to 2 years.

(6). The pay of the principal and professorial staff should be increased considerably. The minimum pay of the professorial staff should not be less than that of the Executive Engineer—(Imperial) and should rise up to the minimum salary of a Superintending Engineer. The principal should get the same pay as a Superintending Engineer. Unless the pay is increased the service cannot attract the best men of the profession from England. The professors should consist of men who as in Europe or Germany or America have passed with distinction and have achieved some distinction by original work. It is mainly in the poor teaching staff that the chief difference between training in India and in England consists. At least two men from the Public Works Department of the rank of Executive Engineers (the best men available) should in addition be employed so that the practical side of training to suit Indian conditions may not be neglected.

(7). About 8 months to 1 year should be devoted to the investigation and preparation of estimates for projects under (a) irrigation works, (b) railways and roads, (c) water-supply and drainage. This course may be given either while the students are undergoing the theoretical course, or after they complete it. I think this course will be very useful. I understand that in Roorkee each class of engineers takes up a project, and does the field work, estimating, plan drawing, etc., for it.

(8). During the remaining period out of the two years of the practical course, the students should be attached to the Public Works or other divisions where big and important works are in progress. A stay of two or three months on each work may do. They should be made to inspect as many big works as possible. Definite course should be laid down for the practical training of students. This should include practical instruction in the use of contractor's machinery and management of labour, materials, etc. They should be made to write out a clear report on each work to which they are posted on the lines to be laid down. There can be no objection to posting more than one student to a particular work. Under present conditions the student is posted to any district at random; there may be no important work at all in that division and the student gets no benefit. Students should be posted to large works even outside the province, if necessary.*

* Mr. Ayyar afterwards wrote on the 11th April 1917.

In my written memorandum, I made no remarks about irrigation works, as no remarks had been called for on it. The subject having cropped up at the time of taking oral evidence, I now add a few remarks on the subject. There is now a separate minor irrigation establishment under the direct control of the Collector, with a staff of supervisors, overseers and sub-overseers for all non-deltaic portions whose duty it is to execute the repairs to minor irrigation tanks.

There is in addition a separate establishment under the Public Works Department for Tank Restoration Survey works with one Executive Engineer for each circle and many sub-divisional officers, overseers and sub-overseers. The expenditure on this establishment is very large. It can be entirely avoided if the minor irrigation staff under the Collector is strengthened and their pay and status are improved. Repairs to buildings may to some extent be also executed by this staff. If so required, the minor irrigation head of the district may be placed under the control of the district board engineer. Such an arrangement will result in considerable savings under establishment.

M. R. RY. GOPALA AYYAR called and examined.

2,334. (President.) The witness stated that he was the district board engineer of Guntur and that he had taken the Madras University B. E. degree.

2,335. The total annual expenditure on works in his

district was approximately Rs. 4,00,000 to Rs. 5,00,000. Of this only about Rs. 50,000 was for buildings and the remainder was utilized for the construction and maintenance of roads. The percentage of establishment to

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works probably amounted to about 15 per cent. but he had not worked* it out. His staff consisted of 4 Assistant Engineers (one in the first grade, Rs. 250—Rs. 300 a month, one in the second grade, Rs. 200—250, and two in the third grade Rs. 150—200 per mensem) three overseers, and 8 or 9 sub-overseers.

2,336. All work was executed by contract. Such contracts were given for the entire work, except in cases where the contractor was unable to supply the materials or about the quality of which there was any doubt, e.g., cement, *jarrah* wood, etc., which were supplied to the contractors, but bricks were manufactured locally by the contractors themselves. It was necessary to retain the supply of cement in the hands of the board as it was more economical and there was a danger of the supply of an inferior make. In cases where contractors were supplied by the district board with the materials only labour charges were paid them. The major portion of the expenditure of the board was on the maintenance of roads and the system adopted was to give out short lengths of road of ten to fifteen miles to one contractor. Separate contracts were not drawn up for the collection and spreading and consolidation of metal, and it was the practice to combine the two in a single contract. Petty repairs were also executed by contract, except in

* Mr. Ayyar afterwards submitted the following statement.

Percentage of the cost of local fund engineering establishment to outlay on works executed by it.

Years.	Percentage for Guntur district.	Percentage for the whole presidency.	REMARKS.
1915-1916	13.3	12.1	Vide page 114 of No. 204 of Government of Madras letter to the India Government on the working of local boards G. O. No. 205-L., dated 8th February 1917.
1914-1915	16.9	11.1	Vide page 242 of Madras Government letter to Government of India, No. 149-L., on the working of local boards and Madras Government's G. O. No. 150-L., dated 1st February 1916.
1913-1914	19.9	11.4	Vide page 241 of Madras Government's letter to Government of India, No. 73-L., also Madras Government's G. O. No. 73-A. L., dated 19th January 1915.
1912-1913	12.5	11.5	Vide page 238 of Government of Madras letter No. 28-L., dated 5th January 1914; also Madras Government G. O. No. 29-L., dated 5th January 1914.
1911-1912	10.4	12.6	Vide page 236 of Madras Government's letter to Government of India, No. 88-L., also G. O. No. 89-L., dated 15th January 1913, of the Madras Government.

the case of the more important roads which were maintained departmentally, but there was very little work of this nature. The Guntur District Board did not repair its roads during the open season and repairs were generally carried out in the rainy season. At some points of his district there were road dams, and if these were washed away during the rains they were repaired departmentally or by contract, as was found convenient.

2,337. From his experience of three or four districts, besides Guntur, as assistant and district engineer, he thought that a satisfactory class of *mistris* was not obtainable, and advocated the establishment of technical schools for the training of *mistris* to teach them the reading of plans and the preparation of the details of a building project. He did not mean to imply that such *mistris* should be able to survey, but that they ought to be able to estimate petty works. At the technical schools he had suggested, he proposed that concrete laying, setting up of buildings, the compositions of mortar, and elementary principles of engineering should be taught and that the men should have some general knowledge. He would leave admission to the school open to all classes, but considered it would be preferable if men of the artisan class were obtained. In his opinion, people of the latter class would avail themselves of the opportunity thus afforded and join the schools, if instituted. *Mistris* and lower subordinates could be trained in the same institution but it would be better not to amalgamate the two, particularly as lower subordinates would be of better social standing and have some knowledge of mathematics. There was a school for lower subordinates at present in Madras, but it was insufficient for the requirements, as it did not train a sufficient number of such men. During the past two years he had experienced great difficulty in obtaining suitable sub-overseers, but lately there had been an improvement.

2,338. It was difficult to recruit upper subordinates as they were poorly paid. Similar difficulties prevailed in the recruitment of lower subordinates as there was ample scope for them in the municipalities and the demand was larger than the supply. Very few upper subordinates took up service under district boards as the prospects were not good. Assistant Engineers were available and in his opinion their number was not greater than the demand. He subsequently admitted, however, that some Assistant Engineers accepted appointments as upper subordinates in the Public Works Department, but added that as there was no scope for them in the Public Works Department itself many preferred to serve as Assistant Engineers under district boards to accepting appointments as upper subordinates in the Public Works Department, because of the better initial pay offered by district boards.

2,339. There were some irrigation major works in the Guntur district and also a few minor works under the Collector, but he had no connection with them. The district boards might be willing to take over some of those works, if it was made worth while, and the only condition on which he would be prepared to accept such works would be that the actual expenditure on them would be defrayed by government. In his opinion it would not be possible for the boards to take over such works on the basis of a grant-in-aid calculated with reference to the average actual expenditure during a certain number of years. Hence he thought that the calculation should be based on the actual annual expenditure plus departmental charges. He did not express an opinion as to the suitability of the system proposed, but thought that if government desired to entrust work to the boards they might be prepared to take them over on the above understanding.

2,340. The maintenance of government buildings could be transferred to district boards but he thought that such a transfer was likely to result in friction between the boards and the Executive Engineers, in cases in which the Public Works Department retained administrative control of the buildings, owing to allegations to the effect that work was done unsatisfactorily. The same objection would however not apply to petty repairs to buildings as there was hardly any likelihood of an

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acrimonious note being struck in the case of such work. He could not affirm whether the boards would welcome the transfer as he had not discussed the question with them.

2,341. He did not approve of the present system of selection for government appointments, as he thought that it did not always secure the individual who was most qualified. To his mind competition was the best method of recruitment and should be the recognised system in all the services, the appointments could then be given in the order of the results of the examination. He knew of cases where men had been selected for a civil engineer's appointment although their profession was mechanical engineering.

2,342. In place of the present four years' theoretical and one year's practical course in civil engineering he recommended the substitution of a three years' theoretical and two years' practical course, as he thought that students should devote a larger amount of time to the investigation of schemes and the preparation of estimates. The practical training he advocated might be given by the Public Works Department, but if there were any large works under construction by private firms there was no objection to the students being attached to such works.

2,343. He also advocated the appointment, to the teaching staffs of engineering colleges, of experienced Executive Engineers as he considered that they could give the students better and more practical instruction. He emphasized, however, that the officers so deputed should be of the very best and not those who had proved failures as engineers.

2,344. (*Sir Noel Kershaw.*) He did not agree with the view that a good engineer might prove a bad teacher, and was of opinion that anybody could become a teacher.

2,345. The transfer to district boards of the construction and maintenance of buildings costing not more than Rs. 75,000 would result in a considerable increase in the work of the boards, and lead to inadequacy of staff and a considerable augmentation as well as improved rates of pay would be necessary in order to cope with the increased work and to attract the better class of men.

2,346. The only difficulty in the calculation of establishment charges would be in the case of large buildings costing Rs. 50,000 or thereabouts. A whole-time clerk

of works or overseer would have to be placed in charge in such cases but in order to obviate any refinements in calculation he thought that if government paid a percentage of 15 to 20 per cent. to the district boards, for work done by their establishments the boards would be able to cope with government works costing not more than Rs. 75,000.

2,347. (*Mr. Cobb.*) Provided district boards did not stand to lose by the transfer to them for construction and maintenance of all the government buildings in the district, and were given adequate grants-in-aid therefor, he did not think they would oppose such transfer.

2,348. The members of the boards evinced a considerable amount of interest in the budget, and some of them also watched the actual construction of works by paying them occasional visits. He could not say definitely, however, what proportion of the members did so.

2,349. He did not think that the retention in the hands of the district board of the supply of materials to contractors hampered them in any way. On the contrary he was inclined to the view that it was of great help to them.

2,350. (*Mr. Howley.*) The district board engineer was not generally a member of the board, but some boards invited that officer to attend their meetings. He himself had received such an invitation and had attended the meetings of the board ever since.

2,351. He suggested the substitution as instructors of Executive Engineers in engineering colleges in place of upper subordinates as the latter, who were at present employed, were not sufficiently qualified to teach engineering.

2,352. In his opinion, the establishment charges on buildings would be greater than on roads, as the former required more supervision, especially if the buildings were scattered.

2,353. In deltaic portions nearly Rs. 400 to Rs. 500 per mile were spent on the maintenance of roads. No fixed system was followed as to re-metalling, but generally roads were re-metalled every 6th or 7th year.

2,354. The Superintending Engineer scrutinised, free of charge, the larger estimates and plans prepared by the district engineer. If on such scrutiny he found them unsuitable he had them revised and this resulted in their re-submission a number of times.

N. MACMICHAEL, ESQ., I.C.S., Collector of Ganjam.

Written Statement.

2,355. (I) Economy and suitability of methods of execution of public works, and (II.) Encouragement of other agency.—Speaking generally, I am of opinion that the methods at present adopted for the execution of civil works are economical and suitable. Contractors who wish to take up works have every opportunity for doing so. It is not lack of opportunity but the fact that it does not pay contractors of standing to take up small works in out-of-the-way districts that prevents them from coming forward. In the district with which I am familiar, large works costing over a lakh of rupees are very unusual. It may pay a large firm to take up such a work as the construction of a Collector's office, but it will not pay a firm to keep a staff in a district to carry out the ordinary repairs to government buildings which are constantly found necessary. If such works were entrusted to firms of standing the important question of supervision by government during the carrying out of the works would arise. The firms are out to make a profit and unless careful supervision is exercised the work will be scamped, if not by the firm itself, by subordinates. It seems possible that in large cities like Madras the carrying out of large works by contractors might be more economical. My impression is that more could be done to encourage private enterprise by relaxing the present rules about the local purchase of engineering stores and materials.

2.) The district board employs a skilled engineering establishment and all its works are at present executed by its own staff or by private agency. The only road in

this district (Ganjam) now maintained by the Public Works Department is a short piece of ghaut road between Russellkonda and Balliguda, which lies outside the jurisdiction of the district board. The maintenance of this road could without inconvenience be looked after by the engineering establishment of the district board. None of the municipalities in the district employ a skilled Public Works agency, and it would be out of the question for them to attempt to carry out any of the works now executed by the Public Works Department.

(3.) It would be possible to entrust the upkeep of government buildings to the district board, but I do not think it is desirable to do so. The district board engineering staff has got quite enough work to do as it is. A more serious objection would be the question of government inspection, sooner or later it would be certain to lead to undesirable friction between the district board engineer and the government officials. The position of the president, district board, would not be enviable, and I think very few presidents would agree to the arrangement.

2,356. (IV.) Relations with other departments and sub-branches—I believe the Public Works Department generally meets the needs of other departments. One minor matter in which I think improvement is possible is the maintenance and repair of government residences. The painting, white-washing, etc., are at present done by untrained coolies and the work is usually unsatisfactory and causes a good deal of quiet discomfort to the tenants. It might, I think, be found possible to maintain a small trained establishment to attend to such work.

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[Continued.]

MR. N. MACMICHAEL called and examined.

2,357. (*President.*) The witness stated that he was the Collector of the Ganjam district.

2,358. There were three municipalities in the district and the largest, that of Berhampur, contained between 30,000 and 40,000 inhabitants while the other two contained about 20,000 inhabitants.

2,359. The engineering staff of each of these municipalities comprised only a sub-overseer who attended to ordinary road repairs and the maintenance of buildings, also the construction of elementary schools and other small buildings. He could only recall one instance of the construction of a large work by the Public Works Department during the past nine years. It related to a water-works scheme in Berhampur and was almost completed. Hence the question of the agency for its maintenance had not arisen, but he thought the intention was to entrust it to the municipal council.

2,360. The district board of Ganjam employed its own engineer at a salary of Rs. 500—20—700 a month.

2,361. The average annual expenditure on works by that district board was approximately Rs. 4,00,000, and the percentage of the cost of establishment to works, which varied, was generally about 12 per cent.

2,362. The district board of Ganjam maintained its roads in a satisfactory condition except a small stretch of ghaut road, between Russellkonda and Balliguda, which was maintained by the Public Works Department. It was undesirable to entrust the maintenance of government buildings to district boards, as it would lead to friction owing to the supervision, which he presumed would be necessary, of the Public Works Department, to ensure the proper execution of work. By this he meant that a time would come when an Executive Engineer or the officer responsible for such inspection work would report that work had not been satisfactorily executed by the district board engineer, and the Collector, as president of the district board, would be placed in an invidious position. The status of the district board engineer besides was not equivalent to that of an Executive Engineer; and furthermore every official, of whom there were a large number in Ganjam, would frequently approach the Collector in connection with repairs to their residences; an Executive Engineer could better defend his actions on such occasions. Apart from this he, as president of the district board, would not be in a position to deal with such complaints as his time was already fully occupied. The district board engineer also was kept sufficiently busy and, even if non-residential buildings were transferred to the district board for maintenance, a larger and better paid staff would have to be employed. He failed, however, to see the advantage of such an arrangement, as the Public Works Department would still have to maintain an establishment for the construction and maintenance of irrigation works scattered all over the district.

2,363. He had *zemindari* work in a part of his district and in those areas the Public Works Department had no irrigation work to attend to. There were, however, a few government and police offices in the *zemindari* areas and the repairs to these could be specially arranged for. Otherwise, as the major portion of repair work was situated within the same areas as the irrigation works, the Public Works Department, Irrigation Branch, could generally speaking execute the repairs to such buildings without any material addition to its duties. His opinion in the matter was, of course, that of a non-professional man.

2,364. He had charge of a number of minor irrigation works which cost between Rs. 40,000 and Rs. 50,000 per annum to maintain. The establishment employed for this maintenance work was under his direct control and consisted of a supervisor whose pay was Rs. 125 to Rs. 150 a month, two overseers on an incremental pay of Rs. 60 to Rs. 100, and five sub-overseers on a salary of Rs. 30 to Rs. 50 a month. Their duties were confined to the preparation of estimates and the supervision and measurement of works, which latter were generally undertaken by contractors. The district board minor

irrigation works were situated within the same area as the Public Works Department irrigation major works, but he did not know why the employment of two district irrigation establishments in the same area and performing practically identical duties was justified nor could he explain why certain minor irrigation works should be entrusted to the Collector, rather than to the Public Works Department Irrigation Branch. The only reason he could think of was that such works were supposed not to require much professional attention and that they were perhaps maintained more economically through the agency of the Civil Department. He was inclined to this opinion because the rates for the repair by the Civil Department of minor irrigation works were, in some cases, cheaper than those of the Public Works Department for the repair of major irrigation works. The Civil Department had a separate scale of charges for minor irrigation works, and this did not exceed the Public Works Department scale. On the contrary, rates were sometimes lower.

2,365. There was very little *kudi maramat*, that is work done by the people themselves in connection with the repair of minor irrigation works, in the Ganjam district. The reason for this was that the practice had not been enforced. He could not recall any instances in which the Public Works Department had endeavoured to obtain unpaid labour for the repair of irrigation major works, but thought there was some force in the argument that as the repairs to minor irrigation works were trivial the Public Works Department would have considerable difficulty in obtaining labour for such work just when it was required, whereas the revenue staff were much better circumstanced in this respect. Should a breach occur in a canal during the rains, he thought that the people living in the locality would be asked to assist in its repair, but such labour would not be procured for ordinary annual repairs.

2,366. He did not approve of the present system in force in his district, under which there were three distinct establishments for the execution of public works, *viz.*, an establishment for irrigation major works and government buildings, a district board establishment for local roads and buildings, and a small irrigation establishment for the maintenance of minor irrigation works, and speaking for himself he would be glad to be relieved of the responsibility for minor irrigation works as the arrangement was unsatisfactory from a Collector's point of view. The permanent establishment he employed for these works was very small and he experienced difficulty in recruitment on account of the poor prospects offered. The men were not borne on a general cadre, and were not transferred from district to district according to requirements and consequently this made it all the more difficult to obtain suitable men to fill the vacancies. The sub-overseers employed were not fully qualified, and consequently the *tehsildars*, who checked measurements of works, had to look for professional advice to either the supervisor or the overseers. He was not aware of the date from which the establishments for major and minor irrigation works were split up.

2,367. The Superintending Engineer very rarely inspected the work of district boards, and was required to submit to the Collector an annual report on the work and qualifications of the district board engineer. It was not the practice for the Superintending Engineer to inspect the office of the district board engineer, and he did not suggest alterations to works in progress in his inspection notes.

2,368. (*Mr. Cobb.*) He desired to be relieved of the minor irrigation works under his charge, not because such works were not within the sphere of his legitimate duties, but because the Revenue Department was not a professional department and he, as an officer of that department, possessed no technical knowledge of engineering.

2,369. In his opinion, the efficiency of the engineering staff of a district did not interest the members of its board who, as a matter of fact, treated the passing of estimates for the maintenance of roads as purely routine

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matter, but they evinced greater interest in original works, e.g., the building of a bridge over a river. A member who was in possession of a motor car, however, would probably be anxious that those portions of road which were used by him should be kept in good repair and hence indirectly the public who also made use of those roads was benefited. The members, on the other hand, were interested in administrative questions such as the construction of schools and roads in particular localities. As an example of this he stated that in one of the *taluks* in Ganjam the construction of wells

and schools was carried out by the village *panchayats*, a member of the *taluk* board being placed in charge for supervisory purposes, and added that most of these village *panchayats* took a considerable interest in work of that nature, but the question whether such interest would increase with the flux of time depended on the personality of the president for the time being of the *taluk* board. In other words the scheme he had outlined only worked well in cases where the president took a lively and personal interest in the executive and administrative work of the board.

R. SRINIVASSA AYYAR, ESQ., M.A., Deputy Accountant-General, Madras.

Written Statement.

(N.B.—The views expressed in this note are purely personal and are in no way those of the Accounts Department.)

2,370. Prohibition against making payments during the last days of the month.—So far as Madras is concerned, there has been no prohibition against making payments during the last days of the month.

2,371. Date fixed for the submission of the monthly accounts.—The monthly accounts of Executive Engineers are submitted by the 20th of the next month. So far as is known, this is the date that has been observed in the Department for the last 36 years. In any case, it is difficult to see how the date of the submission of accounts should at all interfere with executive work. The compilation of the accounts is left entirely to the accountant in the Executive Engineer's office, and it is never necessary for an Executive Engineer to be at headquarters for the purpose or even to sign the accounts submitted for audit.

2,372. Prohibition against making advances to contractors.—Advances to contractors, are, as a rule, prohibited, but local Governments may always sanction advances. The prohibition does not also apply to advances up to Rs. 50. Contractors, moreover, are paid on the security of materials which they have brought to work site and these payments are subsequently adjusted in the work-bills of those contractors. Any further relaxation of the rules might entail loss to government and would not be of help to any contractors except those absolutely without capital or credit. The rules on the subject will be found in paragraphs 777 to 780 of Volume I, Public Works Department Code.

2,373. Excessiveness of audit objections.—The rules of audit require that all work payments without sanctioned estimates or in excess of sanctioned estimates should be objected to. The number of objections therefore depends on the number of such works. An increase in the number of these objections reflects on the efficiency of the executive, rather than on that of audit. The objections, however, never as a matter of fact, impede the progress of works. It is possible nevertheless to simplify audit in the following manner:—

The audit of Public Works expenditure consists of the check of the work-bill with the entries in the measurement book and with the estimate and the agreement. The pay order and the payee's receipt appear on the bill itself. Most of the payments, if not all, are made by sub-divisional officers and the above audit is conducted by the accountant in the divisional office. This audit will be complete if the divisional accountant certifies that the claims in the bill are supported by the measurement book, the estimate and the agreement. Any items not in the estimate or agreement and any rates or quantities in excess of those provided in the estimate or agreement should be claimed in a separate bill and specially sanctioned by the Executive Engineer or higher authorities as the case may be. If this procedure is adopted there would be no necessity for any elaborate monthly audit in a central office such as obtains at present. The change will involve larger powers and responsibility being given to the divisional accountant, who is at present merely a glorified clerk. In that case the test check of the divisional accountant's work conducted at the yearly inspections will be quite sufficient. The accountant should submit to the Super-

intending Engineer a monthly statement of expenditure without or in excess of sanctions. The Executive Engineer may be relieved of all direct payments.

2,374. Unsuitability of financial year.—This is a general question affecting the whole government accounting, and must be settled with reference to the methods and requirements of other departments as well. As a matter of fact, however, it is seen that the expenditure in April and May is generally very low as compared with other months of the year. This would hardly be the case if the financial year, closing in March, really ends in the middle of the working season.

2,375. Changes in budget system.—The budget procedure in regard to the Public Works Department has now been brought into line with that in force for other departments. Steps have been taken to obtain very early forecasts of the estimated revenue and expenditure of the year so as to ensure timely surrender or addition of grants as the case may be.

2,376. (I.) (General.) It is understood that this inquiry does not relate to irrigation works.

(a) Two Annexures A and B are appended showing the expenditure on works and on establishment in Madras for the three years, 1913-14, 1914-15 and 1915-16. The percentage of establishment charges to the works expenditure, works out to 27 to 30. Now if the expenditure on buildings and roads is completely left out, the consequent saving in establishment will not be proportionate to the saving in the total works expenditure carried out by the Department. Although there will be some reduction of establishment, the reduction will, as indicated in Annexure A, not be proportionate to the reduction in the total expenditure caused by the exclusion of the expenditure on buildings and roads, so that the ratio between the establishment charges and the remaining works expenditure will be higher than 27 or 30 per cent. mentioned above, while the new agency to whom the buildings and roads may be transferred, will, if it happens to be a private one, add their supervision charges and profit to the works expenditure. In Bengal, district boards used to have charge of all the buildings and roads in the *mofussil*. The district boards used to receive 15 per cent. on account of establishment and tools and plant. Since government now incur over 27 per cent. for establishment alone, it would certainly be economical if a similar arrangement could be made here. Almost all the roads in the province are already in charge of district boards, and district board engineers are nearly as highly paid as government Executive Engineers. Large municipalities may also take over the construction and repair of government buildings in those towns.

(b) In the Public Works Department temporary establishments are engaged so as to admit of establishment being increased or reduced as works in any year happen to increase or decrease. As a matter of fact, however, it is seen that temporary establishment (if it does not increase), continues the same from year to year, regardless of the works expenditure of the year (Public Works Department Code, Volume I, paragraph 109). This is largely true of works establishment as well (Public Works Department Code, Volume I, paragraph 796). Qualified and experienced men, whether they are engineers, subordinates or *mistris*, have to be kept on and it is also difficult to get rid of establishment of any kind, especially the costly ones, once they have been entertained.

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(c). Estimates are at present prepared by the overseer and submitted to the Executive Engineer through the sub-divisional officer. The sanction to these estimates is regulated by Public Works Department Code, Vol. I, paragraphs 233 and 321. The limitations laid down under these rules in regard to individual officers may be removed. So long as officers are entrusted with the duties of an Executive Engineer or Superintending Engineer it appears to be invidious to make further distinctions between individual officers of those ranks. The removal of these limitations would simplify procedure and prevent confusion.

(d). It will also greatly relieve Executive Engineers if all works of petty construction and repairs of buildings occupied by civil officers are carried out as contingent expenditure of the Civil Department as is already allowed under Public Works Department Code, Volume II, paragraph 1779 and Civil Account Code, Volume I, Appendix BBBB (u).

(e). In my opinion economy should also be exercised by reducing the number of works undertaken by government. Government should withhold for example the construction of residential buildings. It is not the duty of the state to provide quarters for all its officers, much less to provide them free, or at great loss to the state. The concession was perhaps necessary 50 years ago, but it should become less and less necessary year after year. It is certainly not desirable to extend the concession to officers who had never enjoyed it before. The capital spent on residential buildings in the presidency to end of 1913-14 (*vide* Annexure C) was Rs. 40,49,557. The rents received, excluding repair charges of the year, amounted to only Rs. 72,722 or to 1.8 per cent. on the capital outlay. Again the outlay on the construction of police quarters in 1900-01 was Rs. 39,600. In 1915-16 it was Rs. 13,37,906. Out of a total expenditure on provincial civil works original works, buildings, of Rs. 34,19,689 in 1915-16, the outlay on new police quarters alone was Rs. 13,37,906. Annexure D gives the expenditure on this head for the years from 1900-01 to 1915-16. The omission of this item in the programme will be a substantial relief as it forms more than a third of the total outlay.

(f). Further, if all payments are made by sub-divisional officers, Executive Engineers may easily have larger executive charges than at present.

(g). The maintenance of existing irrigation works does not require high professional skill, as the charges generally consist of canal establishment, silt clearance and repair of bunds. These duties can be carried out by comparatively junior and less costly sub-divisional officers, while senior and more costly officers, who should be few in number, should be employed on original works of improvement of irrigation.

(h). A large economy may be effected in this province by the abolition of reserve stock. This has been done in Bombay where all materials are purchased for definite works. It should be increasingly possible in every province as communications increase and become more and more expeditious. There should thus be a gradual decrease in the extent of reserve stock. On the other hand, reserve stock in the province has increased year after year. This is specially the case in the Stores Division. There is no separate Stores Division in any other province such as there is in Madras. Stock in this division was about Rs. 3½ lakhs in 1912-13; now it is over Rs. 8 lakhs.

The reserve stock for the last 5 years have been as follows:—

	Stock balance of the province.	Stock in the Public Works Stores Division.
	Rs.	Rs.
1912-13 . . .	7,70,125	3,26,428
1913-14 . . .	8,08,647	3,42,817
1914-15 . . .	8,75,458	4,15,952
1915-16 . . .	9,72,419	5,91,484
31-12-16 . . .	12,80,857	8,18,758

The reserve stock is often utilized for the transfer of materials purchased for works in excess of or in the absence of requirements. The stock purchased as reserve stock often deteriorates or becomes surplus.

II. (a). At present almost all the works are carried out by contractors or piece-workers. Annexure E shows the payments for March 1916 in five typical divisions of the presidency. The larger payments for labour in the irrigation divisions are on account of canal establishments.

(b). The execution of works divides itself into (1) the supply of labour and (2) the supply of materials. Large firms are now resorted to only for the supply of materials. It is not natural that large firms with their headquarters in the chief towns of the country can have greater facilities for the supply of labour. It is not likely that the cost of supervision by the agents of the firms and the profit which the firms would require would be less than the possible saving in establishment caused by the arrangement. The only establishment now employed when a work is done by a contractor is the overseer who takes the measurements of work done. This overseer will continue to be employed for measuring or checking measurements on behalf of government even if the work is done by a large firm employing its own overseers. Should government dispense with its own officer for taking measurements and accept the measurements of the overseer employed by the firm, the pay of the firm's overseer will still be included in the firm's bill and will come back to be paid by government in the end. I am also doubtful whether the officers of the Department are as yet able to hold their own in any dispute or litigation between themselves and the firms. There has been only one instance in recent years of a building work given out on contract to a large firm. The work was estimated to cost Rs. 3½ lakhs and was started in July 1909, but disputes soon arose between the firm and the government regarding the specification and rates and the firm stopped work in April 1911 and claimed damages. The High Court decided in favour of the firm and an appeal is now pending before the Privy Council.

Numerous instances have been noticed of works carried out without agreements. There is no trouble so long as the contractors are petty contractors who are content with small profits, whose resources are limited, who live solely on these contracts, and whose interest would therefore be to abide by the orders and directions of Public Works officers without insisting upon their own legal rights. Another difficulty in entrusting the execution of building works to large firms is that the works are scattered. It is, moreover, only small works costing Rs. 1,000 or less that are the most numerous. In 1915-16 for example there were 4,736 original works and repairs costing Rs. 1,000 or less while there were only 1,494 works costing over Rs. 1,000.

(c). The execution of public works of all kinds in this presidency is very dilatory, and the first estimates of large works is seldom worked to, but the remedy for these defects is a more efficient executive rather than a change in the agency through which the works are carried out. Executive Engineers who are responsible for the detailed estimates, specifications and working plans of important works should also be entrusted with their execution. They should be held individually responsible for prompt and economical execution and in accordance with the estimates, and plans and specifications. They should not be hampered with restrictions regarding the acceptance of contracts or the purchase of stores. The responsibility should not become divided by the transfer of these engineers before the works are completed.

ANNEXURE A.

Showing the total percentage of the cost of establishment to the expenditure on works in the Madras Presidency for the triennium ending 1915-16.

1913-14.			1914-15.			1915-16.			1913-14.		1914-15.		1915-16.	
Outlay on works and repairs.	CONSTRUCTION ESTABLISHMENT.		Outlay on works and repairs.	CONSTRUCTION ESTABLISHMENT.		Outlay on works and repairs.	CONSTRUCTION ESTABLISHMENT.		DIRECTION ESTABLISHMENT.		DIRECTION ESTABLISHMENT.		DIRECTION ESTABLISHMENT.	
	Perma- nent.	Tempo- rary.		Perma- nent.	Tempo- rary.		Perma- nent.	Tempo- rary.	Perma- nent.	Tempo- rary.	Perma- nent.	Tempo- rary.	Perma- nent.	Tempo- rary.
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1,14,25,022	21,31,470	4,46,420	1,26,52,462	23,52,806	4,55,368	1,15,14,668	22,76,063	4,48,173	5,39,470	59,888	5,85,900	58,742	6,12,297	58,539
Total construction establishment	25,77,890			28,08,174			27,24,236		Total direc- tion estab- lishment.	5,99,358	6,44,642		6,70,836	
Add direction establishment	5,99,358			6,44,642			6,70,836							
Total establishment excluding audit establishment in the Accountant-General's office.	31,77,248			34,52,816			33,95,072							
Percentage of above establish- ment to works outlay.	27.8			27.3			29.4							

NOTE.—This percentage will rise by .8 in each case if audit establishment is also included, as the Public Works share of cost of the Accountant-General's office would amount to about Rs. 1 lakh a year.

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[Continued.]

ANNEXURE B.

Showing the expenditure incurred under the several funds and major heads in the Public Works Department during the triennium ending 1915-16.

	1913-14.		1914-15.		1915-16.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
45. Imperial Civil Works . . .	1,56,760		2,24,850		3,22,025	
45. Provincial Civil Works . . .	56,24,423		65,74,874		46,40,508	
		57,81,183		67,99,724		49,62,533 (a)*
Local District Funds . . .	38,663		80,077		82,284	
Local Port and Marine . . .	3,75,913		3,18,037		1,96,485	
Contributions . . .	7,98,644		4,78,341		18,06,410	
		12,13,220		8,76,455		20,85,179 (b)
35. Irrigation Works . . .	2,95,354		1,63,971		3,18,317	
42. Major Works Working Expenses . . .	13,42,798		14,98,473		12,46,942	
43. Capital Works . . .	1,63,734		2,09,571		2,03,048	
43. Revenue Works . . .	3,03,614		3,42,709		2,65,546	
43. Not kept Works . . .	14,49,271		15,60,232		13,43,533	
43. Agricultural Works . . .	5,90,334		7,05,556		5,44,490	
49. Capital Works . . .	2,83,118		4,92,922		5,41,517	
Local Irrigation Cess . . .	2,396		2,849		3,563	
		44,30,619		49,76,283		44,66,956 (c)
TOTAL . . .		1,14,25,022		1,26,52,462		1,15,14,668 (d)

* NOTE.—(1) The expenditure on Original Works—Civil buildings alone was	Rs.	34,93,620
Deduct expenditure on Original Works in Government House		73,931
Net expenditure on Original Works—Civil buildings		34,19,689

NOTE.—(2) Taking the figures for 1915-16 if buildings and roads are transferred to some other agency, the Public Works Department will cease to deal with (a) in the adjacent column. Local funds, port authorities, etc., will make their own arrangements as regards (b) and the Public Works Department will have to deal only with (c). The outlay on works carried out by the Public Works Department will now be about Rs. 45 lakhs (c) instead of Rs. 115 lakhs (d). The reduction in establishment possible by the arrangement will be roughly as follows:—Out of the 36 divisions, it will not be possible to effect any reduction in the following divisions—9 Delta divisions, 1 stores divisions, 1 workshop division, 2 special project divisions, 1 Chingleput division and 3 Tank Restoration Survey divisions or 17 divisions in all. Two divisions, namely, the North and the South Presidency divisions may be abolished. With regard to the remaining 17 divisions it will not be feasible to reduce more than a third of the establishment of those divisions. If we take this reduction to be the establishment of 7 divisions, the establishment that could be dispensed with altogether will be that of 9 divisions in all. The total cost of establishment during 1915-16 for 36 divisions was about Rs. 34 lakhs. It will be $\frac{2}{3}$ of 34 or Rs. 25 $\frac{1}{3}$ lakhs for the total irrigation works outlay of Rs. 45 lakhs as stated above. In other words the ratio of establishment charges to works outlay will be over 55 per cent. instead of 27 or 30 per cent.

ANNEXURE C.

Showing the percentage of net receipts on the capital cost of residential buildings at end of the years 1913-14, 1914-15 and 1915-16.

	CAPITAL COST TO END OF—			RECEIPTS DURING—			MAINTENANCE CHARGES DURING—		
	1913-14.	1914-15.	1915-16.	1913-14.	1914-15.	1915-16.	1913-14.	1914-15.	1915-16.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Total classes I and II quarters.	40,49,557	37,21,894	38,16,545	1,47,452	1,41,885	1,52,655	74,730	67,955	72,837
Deduct repairs . . .	..	..	..	74,730	67,955	72,837	..	..	..
Net receipts . . .	..	..	..	72,722	73,930	79,818	..	..	..
Percentage on capital cost	..	..	..	1.8	1.99	2.09	..	..	..

NOTE.—The capital outlay in 1914-15 and 1915-16 excludes buildings whose capital cost is Rs. 5,000 or less. The capital outlay to end of 1913-14 given above excludes only quarters whose capital cost is Rs. 1,000 or less.

The number of quarters in 1913-14 was 334.

Ditto 1914-15 " 249 due to the omission of quarters costing Rs. 5,000 and less

Ditto 1915-16 " 263.

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[Continued.]

ANNEXURE D.

Showing the expenditure on police works for 16 years ending 1915-16.

	Outlay on original works. Rs.
1900-01	39,600
1901-02	41,020
1902-03	1,37,921
1903-04	1,32,297
1904-05	1,51,314
1905-06	2,96,033
1906-07	3,69,255
1907-08	4,25,208
1908-09	3,84,790
1909-10	4,61,371
1910-11	6,15,932
1911-12	6,50,065
1912-13	9,80,759
1913-14	13,29,292
1914-15	13,35,791
1915-16	13,37,906

ANNEXURE E.

Showing cash payments on the several Public Works Department Forms for March 1916.

DIVISION.	ON FORM No. 14.		ON FORMS Nos. 15 AND 16.		ON NOMI- NAL MUSTER- ROLL.	OTHER PAYMENTS.	Total cash payments.
	No.	Amount.	No.	Amount.	Amount.	Amount.	
<i>Vizagapatam.</i>							
Below Rs. 200	38	Rs. 2,887	46	2,959	1,912	5,420	..
Above " 200	23	13,068	9	3,256			
TOTAL	61	15,955	55	6,215	1,912	5,420	29,502
<i>Godavari, Northern.</i>							
Below Rs. 200	37	2,994	19	975	3,946	1,882	..
Above " 200	24	14,615	4	1,428			
TOTAL	61	17,608	23	2,403	3,946	1,882	25,839
<i>North Presidency Division.</i>							
Below Rs. 200	11	939	27	2,398	5,057	7,678	..
Above " 200	23	42,765	15	7,943			
TOTAL	34	43,704	42	10,341	5,057	7,678	66,780
<i>Cauvery Division.</i>							
Below Rs. 200	38	3,380	47	3,379	4,581	5,199	25,285
Above " 200	14	7,490	5	1,256			
TOTAL	52	10,870	52	4,635	4,581	5,199	25,285
<i>Coimbatore Division.</i>							
Below Rs. 200	37	3,541	103	8,490	8,844	9,898	55,320
Above " 200	37	16,681	20	7,866			
TOTAL	74	20,222	123	16,356	8,844	9,898	55,320

MR. R. SRINIVASA AYYAR called and examined.

(N.B.—The views expressed are purely personal and are in no way those of the Accounts Department.)

2,377. (President.) The witness stated that he was Deputy Accountant-General, Madras, and that at the time of the amalgamation of the public works and civil accounts he had held the post of Examiner of Accounts. He had therefore had experience of both systems of accounts.

2,378. The divisional monthly accounts in Madras were still compiled in the office of the Executive Engineer and submitted to the accounts office on the 20th of each month, as was the practice prior to the amalgamation, but during September to January they were, for budget purposes, submitted by the 15th or 18th. The schedules submitted with the accounts consisted of a schedule of transfer transactions, a schedule of expenditure, a

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[Continued.]

schedule of rent and a schedule of revenue, and the Executive Engineer was required to sign between fifteen to twenty forms when submitting his monthly accounts.

2,379. He had had two years' experience of the system which had been introduced in Bengal four or five years ago by the Accountant-General of that province, under which the compilation of the monthly accounts was carried out in the central accounts office, instead of in the Executive Engineer's office and did not think it reduced work to any material extent. It was claimed that the abolition of the submission of numerous statements had reduced the work of Executive Engineers in Bengal considerably, in that that officer had to submit only a statement of receipts and expenditure with dockets supporting the several items shown in the list, but he doubted whether that contention was valid. For instance, the combination of the schedules of debit and credit transactions had resulted in a numerical reduction, but in no reduction of actual labour since the number of items, their detailed description for purposes of classification, and the time occupied in their writing remained unchanged. Similarly, the compilation under sub-heads in the Accountant-General's office did not effect any appreciable saving of time in the divisional office, as divisional accountants were well acquainted with the specified heads for each transaction.

2,380. The date on which an Executive Engineer was required to submit his monthly accounts did not influence his work in any way, since the Code rules permitted of the accounts being signed by the divisional accountant. It had been argued that it was not possible to compile the divisional accounts until the receipt of the sub-divisional accounts, and that the feasibility of their compilation depended on the interval between the receipt of the latter and that fixed for the submission of the former but the difficulty could be overcome by insisting on the earlier closing of the sub-divisional accounts. He did not agree with the contention brought forward in evidence that the whole of the Executive Engineer's staff had to be impressed for the compilation of the monthly accounts, as such a procedure would only be rendered necessary in cases where the divisional accountant had not had the accounts posted and compiled daily, but suggested that the sub-divisional accounts could be closed on the 25th of each month and transactions after that date incorporated in the accounts of the succeeding month. His general conclusion therefore was that while the Bengal scheme effected a slight saving of labour to the Executive Engineer, it resulted in no substantial saving in the actual work of his office* establishment.

2,381. In certain cases payments were permissible, and had actually been made, to contractors for the supply of materials. But in the case of a contract for the supply of bricks only, no payment could be made to the contractor until the bricks were actually delivered, in spite of the fact that the contractor might have incurred considerable outlay on coal for burning the bricks. He added, however, that government invariably sanctioned advances whenever such a course was necessary. It was true that the procedure in such cases was circumlocutory, but applications for advances had to be made through the usual official channel as they could only be sanctioned by government. If materials, e.g., firewood, were collected at the site of a kiln, audit would not raise any objection to the grant of an advance there-

* Mr. Ayyar afterwards wrote:—

The point is that there is no reduction of work taking both the Executive Engineer's office and the audit office together. In Bengal the classification has been merely transferred from the Executive Engineer's office to the audit office. The effect of this is, that while this saving of labour in the Executive Engineer's office is not large enough to reduce the establishment by a single clerk, the compilation of all the Executive Engineers' offices now falling on the audit office entails work for at least 3 or 4 additional clerks in the audit office. In Madras, moreover, the treasury accounts also are submitted compiled by the treasury officers. Thus the provincial account in Madras can go out earlier than in other provinces.

for as the local Government had permitted payments on account in the case of manufacturing operations.

2,382. The percentage of Public Works expenditure, in both branches, which had been placed under objection by the Madras Audit Department in the last Appropriation Report amounted to 39 per cent. for buildings and roads and 23 per cent. for irrigation works. This high figure mainly referred to expenditure incurred without sanctioned estimates, and excesses over estimates.

2,383. The objections did not refer to the entire expenditure on a work, but only to the sums by which the estimates had been exceeded. With regard to the complaint that the Audit Department raised unnecessary objections to rates which were more the concern of the executive than of the accounts officer, he remarked that the accounts office generally did not object to rates except when they observed differences in the same locality, e.g., if it were found that the rate for brickwork in a particular locality, station or work was Rs. 24 and that Rs. 30 was paid, the Executive Engineer was asked to explain the reason for the difference in the rate and such an objection in his opinion was a legitimate one. He added, however, that it was outside the province of the Audit Department to raise objections of any other nature and that the accounts office only brought differences in rates to notice when the circumstances pointed to unnecessary expenditure from the public revenues. He was then apprised of a few frivolous audit objections which had at times been raised, and explained that it was the practice for accounts officers to eliminate all frivolous objections before their transmission to divisional officers and that possibly the stray instances which had been brought to his notice had escaped the notice of the officers. He added that he, personally, always deleted unnecessary objections.

2,384. He suggested that the divisional accountant should certify to the correctness of entries in bills after comparing them with the measurement books, etc., as this procedure would decrease the number of audit objections and indicate that the accountant had satisfied himself that items in each bill tallied with the agreements and quantities, and reduce the actual work of audit in this respect. The procedure would, in effect, not be tantamount to the accountant doing the audit of bills instead of the audit officer, as neither the agreement nor the estimate were at present available in the audit office, whereas both documents were on record in the divisional office. He further suggested that the divisional accountant might incorporate in one bill all the items which were supported by the agreement and estimates and exhibit the remainder in a second bill, which latter the accounts office need only examine, and added that as the comparison of a bill with the estimate and agreement was already the work of the divisional accountant, his suggestion would not entail additional work for that officer.

2,385. There was no system of peripatetic audit in the Madras Presidency, and only an annual inspection of the accounts of divisional offices was undertaken. The suggestion to introduce a system of travelling audit was considered by the accounts committee of 1888-1889, and negatived on the ground that it was expensive, unsatisfactory and incomplete. He was stationed in Bombay when the system was abolished after it was given a trial.

2,386. He was not in favour of an alteration in the date which was at present fixed for the commencement of the financial year, as payments in the months of April and May were generally small, owing, he believed, to Executive Engineers being overworked in March. The reason for the small payments in April was not because of an insufficiency of funds. The budget in Madras was usually sanctioned in March and communicated to Executive Engineers by the middle of May, but this did not constitute a reason for the low payments in April as Executive Engineers had every facility for making payments particularly as they frequently made payments without sanction, and usually knew beforehand what provision had been made in the budget for their works,

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[Continued.]

Besides, they were allowed to carry on any works during the first three months of the year without a specific provision of funds and to incur expenditure up to Rs. 500 on works in progress without an appropriation, irrespective of the size of the work. He added that the Rs. 500 limit did not deter an Executive Engineer from spending very much more than that sum on a large work costing Rs. 10,00,000 or Rs. 14,00,000, as that officer knew that the objection that would consequently be raised by the audit officer would ultimately remedy itself.

2,387. The scheme he had put forward in his written evidence was based on the understanding that if buildings and roads were transferred to some other agency a still larger proportion of establishment charges would be incurred, and was purely an expression of his personal views. It could in no sense be regarded as an authorized scheme and had not been framed in consultation with officers of the Public Works Department. He added that even if it were accepted, it would be found difficult to reduce the establishments employed in the deltaic divisions.

2,388. As there was a rule in the Civil Accounts Code to the effect that works of petty construction and repair might be carried out by the Civil Department and debited as contingent expenditure, he considered that it should be enforced, thus saving the Public Works Department the preparation of plans and estimates for such works. The rule in the Civil Account Code to which he had referred was not made full use of at present as civil departments were under the belief that the construction and maintenance of buildings was more the duty of the Public Works Department. He thought that the Public Works Department should not undertake minor work of this nature, particularly as civil officers, in his opinion, were competent to undertake it.

2,389. The construction of residences for government officials had proved unremunerative. In the year 1913-14 the return had amounted to 1.8 per cent. only as compared with the 3½ per cent. the ordinary rate of interest. The causes which had contributed to the small return were the grant of rent-free quarters, the recovery, in some cases, of 10 per cent. of the occupant's salary, and the fact that certain quarters had remained unoccupied, and though the return would be increased by the elimination of the capital value of buildings in cases where the grant of rent-free quarters was recognized, he could not, on the spur of the moment, state exactly what the effect of their deletion would be but in any case he thought the receipts would be considerably less than 3½ per cent. A further reason, in his opinion, for the small return on government residences was the construction of quarters for officers who were really not entitled to them. It was here pointed out to him that this matter was one really for government to decide and not an accounts officer, and he promised to furnish a*

* Mr. Ayyar afterwards submitted the following statement.

Statement showing the percentage of net receipts on the capital cost of residential buildings (excluding rent-free buildings) let out at the end of the year 1913-14.

	Capital cost to end of 1913-14.	Receipts during 1913-14.	Maintenance charges during 1913-14.
	Rs.	Rs.	Rs.
Total Classes I and II excluding rent-free buildings.	32,29,508	1,47,062	64,094
Deduct Repairs . . .	..	64,094	
Net Receipts . . .	..	82,968	
Percentage on Capital Cost.	..	2.57	

NOTE.—This capital outlay statement excludes quarters whose capital cost is Rs. 1,000 or less.

statement exhibiting from an accounts point of view his objection solely on grounds of public economy to the small percentage return which at present accrued to government on their outlay on residential buildings.

2,390. The Madras Stores Division had been in existence for a long period, practically from the inception of the Public Works Department in fact, and its accounts were audited by the Accounts Department. It maintained no depreciation or profit and loss account with the result that very often stores which were really unserviceable were shown for years in the reserve stock accounts. As an instance of this he cited a case where 1,200 tins of sensitized photographic paper had been purchased from England, and only 200 tins were issued during a space of two years, and consequently the remaining 1,000 tins had to be written off owing to the paper having deteriorated. Another defect was that articles were often transferred from works to stock when they were in excess of requirements and the results of this system led to a portion of the stock continuing unused for years, thus connoting that the amount maintained was too large. The whole matter had been brought to notice by the Accounts Department and was at present under consideration.

2,391. The system for the payment of salary and travelling allowance bills of the Public Works Department establishments had been altered so as to assimilate it with the procedure in force in the Civil Department, and he did not think the objections raised in this connection by Public Works Department officers were valid, particularly as civil officers had no cause for complaint.

2,392. No separate account was maintained by Executive Engineers for expenditure and receipts other than that connected with the execution of work proper. Acquittance rolls, as in other departments, were prepared by the divisional cashier or an accounts clerk.

2,393. (Sir Noel Kershaw.) He was only concerned with the audit of Public Works accounts, and had no connection with local fund audit.

2,394. The figures in his written statement showing for the past five years the provincial stock balances and those of the Stores Division represented generally the cost prices of the articles, and this applied also to such articles as had deteriorated, or become surplus, until such time as they were formally reported as unserviceable and sanction to their write-off obtained.

2,395. No interest was charged either on the value of the stock in the Stores Division or on the capital cost of a government brickfield. Further, no charges for supervision, storage, or establishment were included in the book value of stock. There was a special Stores Division which cost about Rs. 34,000 a year and this expenditure also was excluded from the book value of the stock.

2,396. Reserve stock was maintained to obviate delay in the execution of work consequent on the loss of time that might be involved in procuring materials in the open market, and all he objected to was the practice of accumulating more articles than could be utilized, within a reasonable time, on works. Stock was not maintained with a view to the making of profit and the articles were kept only for the benefit of works. Hence no profit and loss accounts were maintained.

2,397. (Mr. Mackenzie.) It was no longer the practice to admit engineer officers into the Accounts Department.

2,398. In his opinion, audit objections did not impede the progress of work as, even after an objection to certain expenditure was raised, further expenditure on the same item was incurred. He could not say whether Executive Engineers were afraid of audit objections.

2,399. He stated that the statement "if the expenditure on buildings and roads is completely left out, the consequent saving in establishment will not be proportionate to the saving in the total works expenditure carried out by the Department," had been explained in Annexure "B" attached to his written evidence, and that it was purely a personal opinion.

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[Continued.]

2,400. In his opinion, Executive Engineers could easily be given larger charges than they had at present, if all payments were entrusted to sub-divisional officers, as a great deal of their time was at present absorbed in the passing of bills. Sub-divisional officers made payments in a few divisions.

2,401. The remark that "the maintenance of existing irrigation works does not require high professional skill" which was made by him in his written statement, referred to canal establishments and to such work as silt clearance and repairs to bunds, the supervision of which, in his opinion, did not require technical skill.

2,402. One of the reasons why the stock in the Stores Division had doubled itself in about four or five years was the general practice of transferring to stock materials which could not be utilized on works after their purchase, and he considered the stock limit might be reduced in order to check this tendency. He was not empowered to question the receipts placed before him during his annual inspection, unless he was positive that articles specified in a receipt had been purchased for a particular work.

2,403. (*Mr. Cobb.*) An Executive Engineer was required to certify annually that all the articles in stock were in serviceable condition and that action had been taken in the matter of those stores which had at the time of their examination been found to be unserviceable. For the past two years and more the photographic sensitized paper he had previously referred to had been

shown as serviceable and it was not within the province of an audit officer to question the classification of a particular article as unserviceable, or otherwise. He was concerned only with the facts as presented to him and was not empowered to take notice of unserviceable stock until he received the Executive Engineer's certificate.

2,404. He used his discretion in respect to audit objections raised by junior clerks in his office, but it was impossible for an accounts officer unless he possessed a technical knowledge of engineering to exercise a really intelligent criticism of the accounts of a division.

2,405. (*Mr. Howley.*) He admitted that no practical benefit had been derived from the new system for the preparation of salary bills.

2,406. The rates of the articles stocked in the Stores Division were only revised on occasions when it was necessary to see that they corresponded with actuals. The Executive Engineer was not required to certify half-yearly that the articles were above or below cost price, but that they were in good order and priced below market rates.

2,407. The large stock of sensitized paper he had referred to was not transferred from the Stationery Office, but obtained direct from England by the Public Works Department.

2,408. In his opinion, the question whether payments should be made by Executive Engineers or by sub-divisional officers was one with which the Superintending Engineer was more concerned.

At Madras, Tuesday, 20th February 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

A. T. MACKENZIE, Esq.

C. S. COBB, Esq., M.V.O.

And the following Co-opted Member :—

W. J. J. HOWLEY, Esq., A.M.I.C.E., Superintending Engineer, Public Works Department.

D. G. HARRIS, Esq. (*Secretary*).

The Hon'ble SIR FRANCIS J. E. SPRING, K.C.I.E., M.I.C.E., M.I.M.E., MEM. AM. SOC. C.E., Chief Engineer and Chairman, Madras Port Trust.

Written Statement.

2,409. *Has not the time arrived for reducing the number of officials in the Public Works Department by the device of getting contractors to carry out most of the work that is now done departmentally?* It seems to me as if the setting of this question may have been instigated by somebody in Delhi, Calcutta or Bombay with little or no real knowledge of every-day practical Indian *mofussil* conditions. Doubtless it would be a good thing to employ a contractor of substance and of repute to carry out a work from start to finish according to specification, provided such a contractor could be trusted to employ perfectly honest and reliable supervising agents who in their turn could be trusted to prevent the scamping, skrimshanking and jerry-building in which, through innate laziness or through yielding to immemorial Indian custom, the local workman or petty contractor, if unsupervised, is absolutely certain to indulge. But where are such reliable firms of contractors to be found? We all know of two or three of them, but will they operate outside their present sphere of action? India is a big country and if such firms consent so to operate, must not they tell off, for the supervision of *mofussil* work entrusted to them, just such skilled professional supervision as is now provided by the Public

Works Department itself, charging of course for all that in their prices. It seems to me to come to pretty much the same thing, so far as cost of supervision is concerned, whether you do it one way or the other way. Personally I would never dream of working through any such firm of contractors. I can claim to know quite as much and probably a great deal more of Indian conditions of labour and materials than is known to any reliable agents whose services could be secured by such contractors. When I work departmentally (as it is called) I am at full liberty to change my plans from time to time as may be dictated by inevitable changes of condition or of better knowledge of conditions without being fought by contractors for their greatly valued "extras." I am quite convinced, when I look back on three or four of the heavy works that I have carried out under my own execution and personal supervision—works of from Rs. 20 to Rs. 60 lakhs in value and expenditure running from a quarter to one crore of rupees per annum—that I could never have carried them to completion in anything like the time I did or within 25 per cent. of my actual costs and rates, had I been hampered by the intervention, between me and my workmen, of a "big contractor," whether on a lump sum contract, or on a piece-work agreement.

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(2). The petty-contractor is quite a different person from the big contractor just referred to. I make use of him continually for parts and sections of my work, whether it be the supply of stone in wagons at the quarry, the setting of stone in the works, the supply of bricks, of lime or of *surkhi*, the setting of brick masonry with or without the above materials in his rates, the erection and rivetting of girders and other steel-work, and so on and so on. But there are certain classes of work on which I would never dream of employing even the petty contractor, for the simple reason that I know far better than he does *how to do it*, with the available labour, and moreover, I can get the labour from the part of India where I know, and he doesn't, that it is to be got. For ordinarily he only knows of and can deal with the labour within ten miles of him, whereas my range may be 2,000 miles. In dealing with the petty contractor I never give him so many cu. ft. or so many tons to do. I inform him that about so many will have to be done and that for the doing of so many of them as I may see fit to let him do before I see fit to stop him he will get the rate agreed between him and me per so many feet or tons. Needless to say, no "big contractor" could work to such conditions, and so, if I employ him, I place a barrier between me and the best interests of my work, and may at a critical moment either be unable to make, or have to pay a high price for making, a change that is in the interests of the work. I could quote a case of a sudden change necessitated from brick to stone, and another of a complete change of design that would have cost me sums running into lakhs of rupees had a big contractor been in it. And yet in both these cases, as well as in many others that I could refer to, the change was absolutely essential in the interests of the work.

2,410. *Will it not be better to leave it to private enterprise in India to supply to the Public Works Department most of the stores which they now obtain from England through the India Office Stores Department?* It seems to me that so long as the India Office Stores Department has got to be kept up—and I am convinced that the time has not come for abolishing it—the busier it is kept the better. Moreover, if you abolish it you are absolutely bound, in order to avoid disastrous failure of materials, to keep up testing and inspecting agencies in India of at least equal efficiency, and probably in at least four separate centres. If I require a bar of steel, to lift a 33-ton concrete block and to go on doing it a hundred times without risk of killing my best diver or my best foreman, I don't go into an Indian shop and buy that bar. I go to the India Office Stores Department, or to my own and equally reliable London Agency, and say plainly what I need the bar for, or 100 of them, and am quite certain that I shall get what I want. I do not want to tell tales out of school, but I know absolutely what I am talking about in this matter. If I am in a hurry I go to the nearest Public Works Department stock depôt and chose my bars—if they will part with them from their India Office heap. And the same with most things of importance. By all means start a similar agency in India and let them pick and choose and test from the stocks in the yards of the firms operating in India. But I must have what I want and I must be *certain of getting it*. All the same I am still of the opinion, to which I have given strong expression off and on in the last quarter of a century, that we ought to try, as a matter of general policy, to deal directly, more and more as years go on,

with Indian firms of repute and reliability—as indeed we are doing all the time. But we shall not be justified in so doing if such a policy costs us more than a fair percentage over and above corresponding English prices, say 5 per cent., not 25 per cent., which is I think now-a-days what such an altruistic policy is mostly apt to cost us. I do not know who the people are, who started this inquiry, but I rather suspect that they are the sort of people who think that anything spelt "steel," or "cement" is steel or is cement, which, as every practical engineer knows is very far from being the case. And the worst of it is the practical engineer in the *mofussil* will usually not have access to the means of knowing whether what he buys is or is not the thing that he wants to buy.

2,411. *Is the engineering education now offered at the Indian colleges conducted on suitable lines?*—In reply I should say, on the whole, yes. But I would like to see special provision made, not in the professional colleges but in schools *ad hoc*, for teaching elementary mechanical drawing to artisans' sons, and teaching them to read a simple drawing when given one. At present not one in ten thousand of them can make or read the easiest drawing of the simplest article—let alone a drawing of an engine or of a machine. As for the Indian-educated professional engineer, I am quite satisfied with his collegiate course of instruction, only I would like to see more manual work put into it. Taken in the lump he is an unhandy creature. Should his level go out of adjustment he will prefer any day to go on working with it until he can get it overhauled in a shop rather than to face the fearsome job of pulling it to pieces. The average Indian boy of the "literate" class would any day rather lose the blade of his penknife than put a new rivet into it. Also rather than put a new pane of glass into his window he would prefer to go without. He knows nothing at all about the stich in time and—of course with exceptions—is altogether an untidy and a sloppy person, as compared with the boy of corresponding class in Europe. He has, all the same, many virtues and personally I am quite content to work with him, with all his disabilities. But somebody *must* impress on him that he had got to learn to be thorough and practical and that his store depôt was never meant really to be a "glory-hole."

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For clerks of works and overseers we are dependent largely on the colleges who really are now-a-days turning out quite good men—men who, when sympathetically handled and encouraged, often in my experience prove quite honourable and trustworthy which was not always the case. Government might, if it liked, do a great deal to encourage young Indians to go through a training in an engineering college by recognizing what I claim to be the fact that a man who has been taught survey scientifically and something of the principles of the flow of irrigational water, and of the making of roads, buildings and culverts is likely to make at least as good a *tehsildar* as a plain B. A., is likely to make—I claim, indeed, a great deal better. But the average civilian administrator is likely, I fear, to miss—and anyhow mostly has missed—this point. In this matter Mysore has given all India a lead in its *Dewan*.

The HON'BLE SIR FRANCIS J. E. SPRING called and examined.

2,412. (President.) The witness stated that he was the engineer-chairman of the Madras Port Trust and had worked as an engineer and as an administrator of railways and of other works in India for 46 years.

2,413. The two original breakwater arms forming Madras harbour had not been constructed by him, but in the past eleven or twelve years he had carried out the whole of the re-construction of the harbour from its original to its present form, as well as the designing and construction of its internal equipment on modern lines.

2,414. During that time he had expended approxi-

mately a million pounds sterling in Madras, but had had no experience of large contractors during his Indian career. Prior to his arrival in Madras he had had considerable experience of important works in other parts of India, but even there he had not employed large contractors, as he found it best, in the light of his local knowledge, to carry out works through the medium of petty contractors who were practically little more than suppliers of materials and of labour. This system may or may not have been followed by him because there were no large contractors available; in fact with the exception of

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a few firms, contractors such as those available in England were non-existent in India at the present time. The point which he wished to make was that he himself and many engineers of like experience, instead of wasting their very extensive local knowledge of men and of materials acquired through years of practical experience, preferred to give the benefit of that knowledge direct to the state or to local governing bodies, in place of relegating themselves to positions in which such knowledge must be comparatively of little value.

2,415. Indian conditions being what they were, and familiar with those conditions as he was, he would not call for tenders for the complete construction of a large work in India. Certainly the construction of large works in other Indian harbours may have been carried out by big English contractors, but he ventured to believe that the Madras Port Trust works were constructed at a very much cheaper cost per unit of structure through the agency of petty contractors and by daily labour. (The witness here handed in for the information of the Committee a form of advertisement specifying the class of materials required in connection with certain of his works and also a form of tender for work to be done under a piece-work agreement. He explained that the tender was, ordinarily, filled in in consultation with the Port Trust engineers or with himself, and that when he had agreed to all the items he signed the tender as accepted.)

2,416. In addition to the main Madras harbour works, he had constructed a large number of smaller works in connection with that port, *e.g.*, transit sheds, merchants' warehouses, powerhouse, workshops, offices and so on, the value of which may have aggregated a quarter of a million pounds sterling, and those works had also been constructed under piece-work agreements. He did not employ large contractors for the purpose as he preferred not to be met with disputes at every turn and perhaps frequently to have to attend in court for their settlement.

2,417. In reply to questions on the subject of bricks, the witness said that it was rather difficult for him to effect a comparison between the local market rates for bricks in Madras and the rates for bricks made by the Public Works Department. Throughout his long career on railway work he could not remember ever having succeeded in making brickwork fit for the vibration of trains at less than Rs. 40 to Rs. 45 per 100 cubic feet. But on his arrival in Madras, he was surprised to find that the recognised rate for brickwork, considered locally to be good enough for most purposes, varied between Rs. 23 and Rs. 28 per 100 cubic feet. He had naturally been inclined to be sceptical at first of the quality of such brickwork, and consequently, for a particular building in the harbour, exposed to vibration of machinery, he had taken pains to secure special bricks from the government brickfield with the result that the construction of his first building cost considerably more than was locally considered usual. He had found ultimately, however, that the common, thin Madras bricks combined with the super-excellent shell lime available locally were quite good enough for use in the construction of ordinary buildings.

2,418. The extent to which petty contractors supplied him with materials depended on his requirements, but ordinarily the local contractors' tenders covered the supply by them of their own bricks. As already stated, the bricks available in the open market in Madras were not of the same quality as those manufactured at the government brickyard, but, except a few years ago, for a certain powerhouse referred to above, he had had no occasion to use Public Works bricks, as country-made bricks were cheap and abundant and suitable for his purposes. He added that such bricks combined with the lime above referred to were quite suitable for the erection of most buildings, except large public buildings and railway work.

2,419. Just as bricks were covered by the petty contractor's rate for masonry, so also the supply of lime was covered. Madras had been the first locality in India where he had allowed this procedure, as the supply there was both plentiful and excellent. His experience in the

Punjab was that the supply of lime under a masonry contract could not ordinarily be relied on, as it was difficult to ensure its not being tampered with, because of its comparative dearness.

2,420. Cement up to the "British standard specification" was made now-a-days in a factory at Madras from which he had for many years obtained as much as the makers were able to give him up to that specification. The question whether it was necessary in these circumstances for the Madras Public Works Department to obtain cement from Europe hinged on the quantity of standard cement the Madras firm, or others like them in other parts of India, could supply. He was obliged to be very particular regarding the class of cement he used, because his works were largely marine works which would be likely to disintegrate unless the British standard specifications were worked to very strictly. The firm referred to had been able to supply him with about 7,500 tons of cement, up to the British standard specification, during the course of about 12 years, but the amount he required in excess of this was obtained from Europe. Much of the output of the firm went, he believed, to the Public Works Department.

2,421. The decision whether to import European stores or to purchase them locally for the Port Trust works, was made according as to which of the two courses was more economical and met his requirements in the matter of time of supply and so on. For instance he had obtained about 1,000 tons of steel well-curbs from firms in Madras, Bombay and Calcutta. On the other hand, he required a couple of thousand tons of steel for some new warehouses under construction and had endeavoured to induce Indian construction firms to tender for Tata's steel, in the hope of thereby helping a nascent Indian industry. But the firms in question failed to quote within 25 per cent. of the price at which he actually obtained the structural steel in question delivered at Madras from England. He had, from time to time, purchased structural steel-work from three firms in Madras who stocked the unmade-up material and, as above stated, had constructed certain work for him, under his supervision.

2,422. He was not well acquainted with the Public Works stock depôt in Madras, but had known similar stores, and especially railway stores in different parts of India fairly well at one time or another. He had recently endeavoured to obtain some 300 tons of steel, for a caisson needed in his cyclone reconstruction work, from local firms but entirely failed to do a deal, because, owing to the war, the local prices of scrap plates had gone up to Rs. 900 per ton. This was 50 per cent. more than the rate at which he had as a fact, later, obtained steel from England for the very same purpose.

2,423. With regard to the suggestion that as stores were purchased largely by Public Works officers by indent on the Secretary of State, such stores could equally well be purchased through the representatives in India of practically the same firms from which they were at present obtained from home, he was of opinion that there were advantages in employing only a single purchasing agency, as at present, instead of several.

2,424. He was inclined to the belief that too large a stock was kept in the Public Works Department's depôts, and that it could be reduced, thus paving the way for the freer local purchase of stores. One of the complaints of the engineering firms in Calcutta, which was perhaps justified to a certain extent, was that, owing to the India Office being indented on for certain classes of stores, firms in India were handicapped in respect to the importation of such stores, and that if the practice of indenting through the India Office were discontinued, these firms could expand their business and indeed perhaps manufacture some of such materials. As regards this complaint he felt that he had a right to express an opinion, having personally been connected with the initial movement which had resulted in the placing of larger orders for the local manufacture in India of small railway girders not in excess of 150 feet in length, as well as of railway wagons. Indeed he had himself drafted the letter from a certain firm to the Government of India which had led to its obtaining large additional orders

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for the manufacture of railway girder work. Ordinarily speaking, however, he would not hope to obtain as cheap and as good materials from Indian firms as he could obtain by indent on England. Manufacturing firms in India stocking large tonnages of bars and plates, not necessarily manufactured to the India Office specification, could scarcely be expected to inform their constituents of the inferiority of their materials, and it was not every Public Works engineer who was in a position to get reliable testing done, perhaps 1,000 miles away from his work.

2,425. He was in favour of the appointment in India of an official buyer for the purchase of all materials procurable in the country at suitable rates, and that indents on the Secretary of State should only go forward for such materials as were not thus available. He understood that the testing laboratory at Alipore was mainly concerned with railway work. For the usual needs of the Public Works engineer in the matter of the testing and inspection of materials, the India Office was as good as could be desired. He added that for works of any importance the testing of materials was most essential.

2,426. He was opposed to the suggestion that, before being forwarded to the Secretary of State, all indents for stores should be scrutinised by a government official who would be empowered to disallow such items as could be obtained in India. Such a scrutinizer would be apt to think of the *written name* of the thing and not of the actual *thing*. Thus, take the petty item sealing wax. There is sealing wax that burns to a cinder before it melts and drops, and there is other sealing wax that melts and drops before it burns. But to the suggested scrutinizer—meaning really one of his *babus*—both are “sealing wax” all right. Only the former is made in India and the latter in England, and according to orders the former must have the preference.

2,427. He considered that an Executive Engineer should make it his business to be aware of the sources of supply of materials. He did not agree with the contention that although local purchase of indigenous articles was permissible in India, yet, for lack of a catalogue or handbook containing the necessary information, it was not possible to ascertain what materials were really manufactured locally or from where they were procurable.

2,428. So far as he was aware there were only two methods of execution of public works in Madras, *viz.*, by petty contractors, who supplied the necessary labour and certain of the materials, and by departmental agency. These two systems were, he thought, the only practicable methods under which, at present, it was possible to execute work satisfactorily, owing to the fact that the out-and-out construction of a large work could not be entrusted to a single big contractor, because there weren't any such men at present—that is any men who could be trusted to work fairly to specification without very close departmental supervision.

2,429. There were no electrical works in the Madras harbour although a good deal of electricity was used there one way or another, obtained from the public suppliers. His electrical stores were purchased locally, as there was no advantage in direct purchase from England owing to the existence, in Madras, of certain good electrical firms, or their representatives.

2,430. There were a certain number of small firms in Madras who doubtless, if properly supervised, could be entrusted with the construction of a bungalow and even with that of a large building but close supervision of their work would be necessary and as at present constituted none of such firms, so far as he knew, possessed the requisite reliable supervising skill, or would care to burden themselves with the cost of it.

2,431. He had had no experience of sanitary works in towns.

2,432. He was not personally conversant with the Madras Public Works Department's methods of carrying out the construction of their buildings, but he thought they employed petty contractors for the supply of labour and possibly a portion of the materials required, and also constructed some of their buildings by departmental labour. From his experience in the Port Trust, he was

quite certain that these methods could not be improved upon under existing local conditions.

2,433. He could not definitely state the ratio of the government buildings in the city of Madras to the private buildings, but he thought that the amount of the former class of work was somewhat larger than that of the latter—at least if the better class of work was referred to.

2,434. Some of the small contractors engaged by him were he believed in the habit of building houses for the public, but he did not think that the quality of the materials and of the workmanship used in their construction was such as an engineer with a reputation would accept. There were a good many fairly large commercial buildings in Madras, but the supervision of their construction had, he thought, been carried out by an experienced architect or engineer. Indeed he was under the impression that a retired Chief Engineer of the Public Works Department now-a-days undertook the design and supervision of most of the better kind of architectural work in Madras.

2,435. He thought it probable that if government threw open their building work in Madras to big contractors, the amount of money available would not be sufficiently attractive to induce reliable firms to establish themselves. But if a firm of the standing of at least two certain Calcutta firms should ever establish itself in Madras, he advocated tenders being called for for all the Public Works Department works from such a firm. Under existing conditions, however, he considered that the present methods were the most suitable. He added that he did not know of anybody in the south of India who was prepared to start an engineering firm on a large scale in the city of Madras.

2,436. (*Mr. Mackenzie.*) He was of opinion that the demand would not create a supply of big contractors within a few years. It would take a long time to create a supply of efficient contractors in Madras, and the process would necessarily have to be a gradual one. In process of time a firm of the standing of the Calcutta firms he had referred to might spring up, and a beginning could then be made by entrusting it with a certain amount of government work and gradually increasing it. Personally he felt confident of being able, ordinarily, to build more economically than a big contractor could, because he managed his own labour and his own petty contractors and did not require a profit of 20 per cent. The best evidence of this was the cost and rates of the Rs. 30-lakh west quay of Madras harbour which, except for the getting of stone from the quarry, which was done by a small contractor, had practically been constructed entirely by daily labour.

2,437. The construction of private buildings would probably enable a petty contractor gradually to develop into a big lump-sum contractor, and, as soon as such a man had reached a certain status, he could of course be employed on government building work, but the Public Works Department could not afford to wait till contractors made themselves efficient, as meanwhile works had to be constructed and it would not do to have them badly erected. Furthermore, the question of the letting-out of government work on large contracts depended very much on the trained supervision which such contractors could procure. All of them would not be able personally to supervise efficiently the construction of the building work that might be given to them.

2,438. He thought that the Madras College of Engineering turned out students who were quite fitted to begin their practical *out-door* training. When they left college they were not of course engineers by any means, or even overseers, and their true training really commenced on their leaving the college when they were not worth more than Rs. 100 a month. He was quite content to employ engineers trained in Indian colleges though of course they had their limitations and certain defects due less to their book-training than to their up-bringing and associations. Amongst such defects, slovenliness, lack of accuracy and inability to “make a finished job” bulked very large. He did not think that, before being granted a diploma, such men should be given a practical training of two years, at the end of their college course. He had for three years been on the Council of the Institu-

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HON'BLE SIR FRANCIS J. E. SPRING.

[Continued.]

tion of Civil Engineers, and had had some experience in the way of advising the Council in regard to the products of Indian engineering colleges. The institution was very much in favour of a two, and preferably a three, years' course for its associate membership, or A.M.I.C.E., diploma, which was the hall-mark of junior engineering competence. A college diploma by itself did not make a youth an engineer.

2,439. As regards the theoretical training of upper subordinates, or men of the clerk of works class, he could only judge by the college syllabus and text books from which he gathered that the course was not too advanced a one. They acquire only such general knowledge of engineering principles as a man who hoped to rise to a position worth Rs. 300 or Rs. 400 a month might reasonably be expected to possess. Simply because they had perforce to earn a living, a large number of men who had passed the full professional engineering course at the different colleges found themselves obliged to accept appointments as upper subordinates,—that is, what in England would be called foremen, or clerks of works. But he would not give such men the advanced training they had received if it could be foreseen that they would never rise above the upper subordinate level. Many of them, however, emerged later into the professional grades so that their training was justified.

2,440. He understood that the training of lower subordinates at the Indian engineering colleges cost very little, in fact that government paid for nearly all their requirements. When an artisan's son had attained the age of about fourteen years he was expected, by his father, to add to the family income, and youths of this class, he thought, would make better lower subordinates and overseers, if only suitable training were open to them, than the *bhadralog* class who were at present principally trained as such. Seven or eight years ago he had in his employment a promising youth of the artisan class, who was still with him and now earned perhaps Rs. 70 a month. He had taken a certain amount of interest in this youth, and had taught him drawing for half an hour each morning, in which subject the lad made good progress. Thinking, therefore, that he might be capable of doing something better than manual labour, he asked the Madras Engineering College if they could give him an elementary drawing training, but the then principal refused to do so, on the ground that the lad had not passed his first arts—or perhaps it was his matriculation examination. As a matter of fact, the youth in question was not capable of rising to this educational standard, and there ought to be classes to meet such cases.

2,441. He would certainly not reduce the educational standard in order to secure the admission to engineering colleges of the artisan class, but he would give the artisan's son an opportunity of being taught elementary engineering drawing, and of earning a scholarship, and would teach the literary class the dignity of using their hands.

2,442. He advocated the establishment in Madras of a testing laboratory similar to the one at Alipore. At present, the Madras Engineering College tested materials, but he understood that such testing was not conducted in an organized manner for the outside public. The testing of materials in Madras should certainly be carried out officially—indeed for all he knew to the contrary perhaps it was so—exactly as it was carried out for railway materials at Alipore.

2,443. The question whether it would be expedient to attach, to the office of the Director of Industries, an official buyer who would be able to judge of the relative prices of materials depended on the personality of the Director of Industries for the time being. That officer would probably have very little real knowledge of the work of

the official buyer, but he would—or at least ought to—be cognisant of the capabilities of Indian firms and of the suitability of the classes of materials they manufactured. Except at Messrs. Tata's works at Sakchi no firms in India now manufactured steel from the ore. They imported plates and bars and put them together; but it might be worth government's while, for the sake of industrial development, to pay a little more for their steel-work, made from the ore in India. He added that the Ministry of Munitions had recently permitted him to arrange for the manufacture in England and the importation of some 300 or 400 tons of steel in the form of a caisson for his harbour work at Madras. He had first endeavoured to obtain the material for this structure locally, but failed to do so on account of the high prices demanded. Fortunately, the Public Works Department, who had a stock of a few hundred tons of the sort of plates he required, got him out of the difficulty by placing the whole of their steel plates at his disposal, and allowing him to take as many of them as he required. However, because of the priority given in England by the Ministry of Munitions, he hoped not to have to use these plates.

2,444. (*Mr. Cobb.*) With regard to the deduction that seemed derivable from his evidence that he claimed to have a better hold over his petty contractors than the Public Works Department over theirs, it was suggested that this might perhaps be due to his work being concentrated and that of the Department scattered. To this the witness replied that he was suggesting nothing of the sort. His preference for the employment of large numbers of petty contractors instead of one big contractor was based largely on his own personal experience of 500 miles of railway work, where he had eight or ten Executive Engineers under him each of whom had two or three assistants, and he did not think that that work could be regarded as concentrated by any means.

2,445. (*President.*) He admitted that the Port Trust work was more concentrated, and therefore easier to control, than the work of the Public Works Department which was scattered over a district. But, anyhow, his experience of many years of work conducted under very varying conditions favoured the employment of petty rather than of large contractors—provided always that the engineer knew his business and was not above doing it.

2,446. (*Mr. Howley.*) A Committee, of which he had been a member, had been appointed a few years ago to consider certain new educational courses proposed in the Madras Engineering College, but, so far as his recollection went, that committee had recommended that the matter should be held in abeyance till the completion of the new college buildings at Guindy.

2,447. (*President.*) Though he was not at present connected with the Madras Engineering College he had been so indirectly for a good number of years, as a Fellow of the University and off and on president of the Engineering Faculty and Member of the Syndicate.

2,448. With regard to the suggestion that the mechanical engineering section of the Madras Engineering College might as well be abolished owing to there being no demand for mechanical engineers in Madras, he explained that the demand for such men existed right enough, but could not be supplied owing to the abhorrence of the student class to manual labour. As a matter of fact, there was plenty of scope in Madras for mechanical engineers with a good knowledge of English. He himself was an employer of between seventy and eighty Anglo-Indians—mostly mechanical artisans or in control of mechanical operations.

The HON'BLE MR. GORDON FRASER, Chairman, Chamber of Commerce, Madras.

Written Statement.

2,449. (I) Economy and suitability of methods of execution of public works, and (II) Encouragement of other agency.—The members of the Madras Chamber of Commerce have had little experience in regard to the class of works undertaken by the Public Works Depart-

ment, and under the circumstances I am afraid the Chamber is not in a position to give evidence which will be of material assistance to the Committee. It is stated in the resolution that the object of the Committee is to decide whether the Public Works Department can be improved and rendered more economical and efficient.

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[Continued.]

It is urged that one method of attaining this object would be to entrust to private agency much of the work at present carried out by the Public Works Department. It is difficult for the Chamber to give an opinion on this point. At the present moment the firms connected with the Chamber are not equipped to carry out large public works, and to undertake this business would mean a heavy outlay of capital. Under present conditions the Public Works Department have their staff of graded officers and subordinates to supervise the work of their sub-contractors.

(2). The Chamber is sufficiently conversant with building work to realize that the closest supervision by responsible officers is necessary in this country if the results are to be satisfactory, and unless the works were taken in hand on a large scale it would not pay firms to engage highly salaried officers for the business. The Chamber has no information on which to base an opinion as to whether public works could be carried out more economically and efficiently by private firms than by the present organised Public Works Department. In expressing this opinion it is understood that the statement refers to firms who would take over complete contracts, and not simply to small sub-contractors who would contract to do one particular work only and would supervise this work themselves.

(3). The suggestion to make greater use of local bodies, some of which at present employ a skilled public works agency, is in the opinion of the Chamber worth consideration, but in regard to this the Chamber cannot write from experience. It is possible that work of a simple and unimportant character might be carried out at a reduced cost under contracts, subject to government inspection, but in this case also the Chamber has no evidence that a reduction in cost would result. Private firms undertaking the work would expect to make a profit on the transaction and they would require experienced officers to supervise in exactly the same manner as in the case of government; also firms undertaking the work, if subject to government inspection, would require such inspection to be carried out by government officials of standing and not to be left in the hands of subordinates. Should government decide to entrust more work to private agency, irrespective of the question of economy, the Chamber is of opinion that such action would certainly encourage firms of standing to interest themselves in the building and allied trades, and so encourage further industrial activity. In the long run

this could not be other than conducive to the benefit of the country, and in the course of time the Chamber is of opinion that the work done by such firms would be equal to the standard of, and compare favourably in regard to economy with, the work now done by the Public Works Department.

(4). As stated in the resolution mentioned above this development of activity in the building and allied trades would tend automatically to react upon the educational system of the country by initiating a demand for highly trained engineers in private employ.

(5). In conclusion the Chamber regrets that it cannot give more definite evidence on the subject-matter of the inquiry, and can only express a general opinion in favour of the suggestion to entrust as far as practicable to private agency some of the work at present carried out by the Public Works Department. That this will result in immediate economy the Chamber has no reason to expect also as regards efficiency no improvement may result in the immediate future, but undoubtedly such action on the part of government would, in the long run, be to the benefit of the country from an industrial point of view. A large department established throughout India, such as the Public Works Department, monopolizing the work of the building and allied trades, cannot fail to tend to strangle the growth of private enterprise. The work of those connected with the Public Works Department is confined to public works carried out by government and under the circumstances there is no scope of initiative in other directions. The encouragement of firms interesting themselves in works for the Department of Public Works would have a far-reaching effect as their efforts would extend in many directions and would promote the initiation of building and engineering work other than on behalf of government.

(6). In connection with the letting of contracts on a large scale to private firms, the Chamber would emphasize the necessity of such contracts being drawn up carefully and specifically by qualified architects and quantity surveyors. The work of the Public Works Department covers such wide ground and such a variety of subjects that it seems to the Chamber the danger may exist of the work not being sufficiently specialized, and officials may be called upon to deal with matters for which they have not had special training, particularly in respect to those requiring a high degree of architectural and constructive knowledge.

The Hon'ble Mr. Gordon Fraser called and examined.

2,450. (President.) The witness stated that he was the chairman of the Madras Chamber of Commerce which was connected to a small extent with certain sanitary engineering and mercantile firms, and that only a few of such firms were manufacturers.

2,451. There was only one architect in Madras and three engineering firms, besides numerous firms which chiefly stocked engineering stores. His own firm had a small workshop in Pondicherry for repair work, and were interested in rolling material, but he thought that a larger number of firms would evince greater interest if they had better inducements. Only two firms in Madras were interested in sanitary engineering.

2,452. There were two electrical firms in Madras, but neither of these was connected with the Chamber. One of them had been bought up by his own firm about eight months previously, and the latter was now working it in Madras. His firm were electrical engineers only in the sense that they were the present proprietors of the firm they had bought. In his opinion there was great deal of scope for electrical engineering in Madras.

2,453. He supported the contention put forward in the memorandum submitted by the Chamber that the petty-contract and departmental systems seriously prejudiced the growth of private enterprise in Madras, as he considered they precluded firms connected with the Chamber from interesting themselves in such work. Firms like his own, which did not employ architects to supervise construction, could not enter into competition

with petty contractors since the latter more or less made such work a family concern. He also considered that the present system prejudiced the construction of private houses in Madras.

2,454. He believed that the amount of government building work in Madras was far in excess of that done privately, and added that there was very little private work under construction in George Town, which was the largest centre in Madras. The new National Bank had been built by a single Indian contractor in accordance with a London architect's plans. Very little supervision was available in Madras for the erection of private buildings, and he only knew of one person who undertook supervising work. He did not think it would be possible for private firms to construct work more economically than government as the Public Works Department were able to reduce expenditure to a minimum whereas the former would have to import their supervisory staff from England. It was true that private firms possessed the advantage of having a freer hand, but though they might eventually be able to construct work more economically it would be difficult for them to do so at the start.

2,455. He stated that the retention of the supply of materials, e.g., bricks, in the hands of government had been justified, but that its necessity might eventually be removed by the rapidly changing industrial conditions in India. The manufacture of bricks and tiles was a paying industry, and as there was a large opening in this direction for private firms, he advocated that govern-

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[Continued.]

ment should obtain their requirements from private sources.

2,456. He knew very little regarding the Public Works Department Stores Division in Madras, but contended that the Department ought to purchase freely all articles of indigenous manufacture, provided they were suitable, as well as imported materials stocked in India by private firms. The importation of European stores was at present restricted by the European stores rules inasmuch as they allowed only for the purchase in India of such articles as were actually available in the country, and firms could not stock a larger quantity and variety of materials unless they were certain of receiving orders from government at all times, and not only when government had run out of stock of certain materials.

2,457. Electrical work had been given an impetus in Madras by the representatives of English firms. These representatives knew their work thoroughly and were probably better qualified than the Public Works Department electrical engineers, and this, he thought, accounted for their having secured nearly all the electrical work in Madras. He was not cognisant of the duties of the Electric Inspector to the Government of Madras.

2,458. He was not aware of any sanitary engineering firm in Madras which was capable of undertaking the construction of large water and drainage works.

2,459. Contractors would welcome further encouragement from government, and many of them would probably employ their own architects if they were assured of the receipt of contracts on a large scale. Private firms at present only constructed buildings for their own requirements as there was no demand for private work. He did not think the time was ripe for the invitation of tenders for both large and small buildings, but suggested that a small beginning might be made in this direction. He admitted, however, that difficulty would be experienced in securing the necessary architects, if this were done.

2,460. He was unable to suggest how the establishment of reliable firms of building contractors might be encouraged in Madras, in view of the paucity of such firms at present. He was also unable to suggest means for the encouragement of private enterprise in other directions, but he thought that government should do something in the matter.

2,461. (*Mr. Cobb.*) He was not aware of any large industrial sources which could be developed in Madras. He was of opinion, however, that it was possible to encourage some small industries *e.g.*, brick manufacture, leather making, and oil pressing.

2,462. By the words 'large scale' in his suggestion that unless works were taken in hand by private firms on a large scale it would not pay them to engage highly salaried architects, he meant a scale which would justify the employment of a qualified architect and his staff from England. He added that there were several architects in Hongkong who employed their own staff and that he believed these architects undertook the supervision of government buildings. On the other hand, when his own firm required the services of a mill architect, it had been necessary to secure one from Lancashire. The construction of the National Bank was supervised by an English architect.

RAO SAHIB T. NAMBERUMAL CHETTY, Contractor, Madras.

Written Statement.

2,468. (I.) **Economy and suitability of methods of execution of public works.**—I consider the methods adopted at present for the execution of works are certainly the most economical. Any change that may be made in the existing methods adopted for the execution of work will not I think enable the supervising staff to be reduced, because from my own experience, which extends over a period of over 25 years during which I have executed many large works for government, I have always found the staff employed by government and the contractors to supervise the work to be the minimum for the purpose

2,463. He did not think that a government department would be in as favourable a position to buy stores as an ordinary business firm, because the latter had a freer hand and were able to select their market, and he stated that he thought government could buy as cheaply from Indian importers as by direct indent. Indian merchants were keen competitors and he had never known, during the past twenty-two years, of any attempt on the part of Indian merchants to combine with the object of increasing rates. On the contrary, they reduced prices in an extraordinary degree, and accepted work for a profit of only 1 or 2 per cent.

2,464. (*Mr. Mackenzie.*) He did not advocate an immediate closure of the Stores Department as government could not under present conditions be sure of securing all the stores they required locally. He considered, however, that government should make their requirements known in order to enable private firms to stock the necessary articles and renew them from time to time.

2,465. (*Sir Noel Kershaw.*) The fact that the major portion of the building work in Madras was at present government work did not connote that the scope for the manufacture of private bricks was small, as the Public Works Department were large buyers of bricks and tiles manufactured on the west coast which also supplied the Kolar Gold Fields with a large number of bricks. West coast bricks and tiles were exported to stations perhaps three or four hundred miles distant, and were utilized in Madras itself. He was of opinion that there was a large market for the sale of manufactured bricks and tiles, independent of the demand from the Public Works Department. He advocated the establishment of a factory and did not anticipate it would have to compete with the Public Works Department; and he agreed that it was very necessary to debit all legitimate charges to the manufacture account in the case of bricks manufactured by the Public Works Department, and considered that many items were excluded by the Department which would be included by business firms. The point, to his mind, was a very important one.

2,466. He considered that the announcement by government of their intention to give out work on a large scale to private enterprise would cause firms to see whether it would be worth their while to take up government work, but as he was not aware of how the Public Works Department were working at present he could not state whether the announcement would lead to an increase in expenditure by government. In any case, the employment by firms of highly paid officers for supervision would be necessary in view of the conditions prevalent in India.

2,467. (*Mr. Howley.*) Although no firm in Madras employed its own architect, he thought that several of those who employed engineers would take up contract work with their present staff. By his suggestion that government should throw open more work to private enterprise, he did not mean to imply that in doing so they should pay appreciably higher rates. His suggestion referred only to large works, as he thought that no large firm would undertake the construction of small government works at the Public Works Department rates, without a profit commensurate with their trouble. He recommended that government might try the experiment at Public Works Department rates and watch the result, as he had not sufficient knowledge to express a definite opinion.

of getting good work done. The cost of the staff employed by government is I understand 23 per cent. and the contractor may expect to make 15 per cent. profit on his outlay, though with the present increased cost of labour and materials the profit may not be so large, it is certainly much smaller than in former years. This makes a total of 38 per cent. If a firm of contractors is to keep up an efficient staff to replace the Public Works Department officers they could not do so for 23 per cent. of the value of work done. I have had occasion to employ private firms for the execution of work of a special nature in buildings in which I have been engaged and I have good reason to believe they have charged me 100 per cent.

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and more on the cost of the work for their supervision. The cost of staff for supervising mere straightforward building work would probably not be quite so high, but no firm could possibly afford to keep up an efficient staff of engineers, architects, draughtsmen, estimators, clerks, etc., and charge only 23 per cent. But assuming that works were carried out by private enterprise, I presume government would still employ persons constantly on the work to watch their interests and see that work was executed according to specification. Occasional inspection would not, I think, suffice; the progress of the work should be constantly watched if government is to get the same quality of work as they are now getting. The best of contractors may inadvertently carry out work not quite up to specification and government supervision would, I think, be very desirable.

2,469. (II.) Encouragement of other agency.—The rates for which government expect work to be done are certainly not sufficiently high to encourage private enterprise. The contractors of the Madras Presidency are, with few exceptions, men with practically no capital, who have started life in a very small way. Many of these men have themselves been workmen on quite small pay and are consequently content with a very small margin of profit. They employ practically no supervising staff

on their works. As long as government continues to employ such men, contractors of standing with capital will not take up work; it is not worth their while. For this reason I have, for some years, entirely given up undertaking government work. I doubt whether these contractors I have referred to would be capable of undertaking any work without the guidance of the Public Works Department staff. If rates are increased, a better class of contractors will be encouraged to take up work.

2,470. (VII.) Education, and (VIII.) Practical training.—The engineers who pass out of the engineering colleges are of little or no use to a contractor, as they lack practical experience. What a contractor wants is a man who can find material and labour at a reasonable price and who can get a full day's work out of the labour employed. It is not until these engineers have had years of experience, if ever, that they acquire such knowledge. If government discontinued supplying contractors with plans, estimates, etc., then perhaps these men might profitably be employed by a large firm in designing, estimating, etc., and they could gradually be trained on works so as to be useful in the manner I have indicated, but it would take time. I have personal experience of such men and I must confess the results were disappointing.

RAO SAHIB T. NAMBERUMAL CHETTY, called and examined.

2,471. (President.) The witness stated that he was a building contractor and teak-wood supplier. He held no engineering diploma and did not employ a trained engineer on his staff, as supervision was exercised by the Public Works Department in the case of government buildings and an engineer was always engaged to watch the interests of the owner for the construction of private buildings. He had abandoned Public Works Department work because of his advancing years and as the profits were inadequate and mentioned that he had also practically given up private contracts simultaneously.

2,472. Private and Public Works Department rates were practically on a par except in the case of some special items in which the Department were somewhat more liberal. Nevertheless, profits in the case of departmental work were smaller as in their case contractors had to wait a long time before receiving instructions, whereas in private work there was invariably somebody on the spot who immediately solved difficulties and thus enabled work to proceed.

2,473. Until very recently table-moulded bricks were not available in the open market and the public were obliged to obtain their supply from government by paying nearly 20 per cent. in excess of the rate at which they were issued to government works. The rate at which table-moulded bricks were now available in the open market was Rs. 15 or Rs. 16 per thousand, as compared with Rs. 13, the government rate, and the private supply was always dearer.

2,474. There were only about thirty or forty contractors in Madras. Government supplied nearly all the materials for its works, e.g., bricks, *chunam* and lime, and a contractor had only to find money for minor items such as wood-work in doors and windows. Contractors were paid once a month for all work, and the only capital required for government work was the amount of the weekly wages of the labour employed. For private work, however, more capital was essential.

2,475. A superior quality of lime was available in the open market, but government retained the supply of lime in its own hands to obviate the use of inferior quality, and did not leave the supply of such optional to contractors. The procedure was not very disadvantageous to contractors, as it saved them the expense of purchasing their own lime. The amount of profit lost thereby on the supply of materials was slight.

2,476. He advocated that the manufacture of bricks and the supply of lime should be entrusted to contractors in order to encourage the growth of private enterprise and stated in support of his recommendation that the present class of Public Works Department contractors were *mistris* or clerks who had formerly been in the

Department, who were content with small profits and the supply of material by government. No firm of standing would be prepared to undertake government work on such conditions.

2,477. He did not anticipate that government would suffer loss if they discontinued the manufacture of their own bricks and entrusted the same to contractors. It was true that the private rate was Rs. 15 per thousand against the government rate of Rs. 13, but in his opinion the true rate for government bricks was much greater by reason of the fact that the present rate did not include departmental and other charges. A similar remark was applicable to the rate for lime.

2,478. The former practice in inviting tenders was to allow intending contractors to scrutinize the sanctioned estimate and to allow for their profit by the addition of a percentage to the estimated rates. This procedure had, however, been abandoned and contractors were now furnished only with the plans, quantities, and amount of the sanctioned estimate and requested to quote their own rates in tenders, and the lowest tender was usually accepted. Entire works were invariably given to one contractor in Madras itself and he was not aware of the practice in the *mojussil*. Except in the case of the construction of the High Court at Madras, for which work he was one of the thirty or forty contractors engaged, all building work had been executed by a single contractor, on the piece-work system, and this had led to the making of bargains by Executive Engineers in the giving out of work. He illustrated his meaning by stating that in a case where three contractors had tendered the lowest rates for wood-work, masonry and earthwork, respectively, one of them was selected and persuaded to reduce his rates for the other two items, in view of the fact that lower quotations had been received from two other parties; and consequently, if a contractor was anxious to take up the work, he would do so at lower rates than his original tender.

2,479. Some of the private buildings in Madras had been constructed by retired Public Works Department officers and subordinates, many of whom were employed in the preparation of designs. There had only been one private engineer in Madras who took up work of this nature, and he was no longer resident there.

2,480. (Sir Noel Kershaw.) It had been the practice, till the last three or four years, for the Public Works Department to sell table-moulded bricks to the public on payment of an additional charge of about 20 per cent. in excess of the departmental rate of Rs. 13 per cent., and it was discontinued from the date table-moulded bricks were manufactured privately, on the ground that the supply was just sufficient for the requirements

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of government. In his opinion, government could no longer sell its bricks at the rate formerly charged owing to the existence of private competition.

2,481. Government table-moulded bricks were not used at the beginning for ornamental work, and most government buildings had been built with ordinary country bricks, plastered over. Government used table-moulded bricks for pointed work only as they were of a special quality. The bricks sold to the public were of two classes, table-moulded and oil-moulded, the former being about Rs. 2 per thousand dearer. The superior quality was used externally and was suitable for pointed work, whereas the inferior make was utilized for internal and plastering work only, because of their edges not being perfectly moulded.

2,482. (*Mr. Mackenzie*.) The government rate for bricks would be a little in excess of the private rates, if the cost of the Public Works Department establishment were added to the cost of actual outturn, and such an increase would lead to a reduction in the private rate. In his opinion, private brick manufacturers only made a profit of 10 to 15 per cent.

2,483. (*Mr. Cobb*.) He admitted that the purchase by contractors of their own materials would lead to an increase in the rates, owing to the fact that the open market rate was dearer by Rs. 2 per cent.

2,484. (*Mr. Howley*.) Notices inviting tenders were inserted in the local newspapers and contractors submitted quotations on their publication.

2,485. Table-moulded bricks had been utilized on pointed work for the past thirty years. Such bricks were not manufactured by government for sale and it was only in extreme cases, e.g., the construction of a public building, that they were sold to the public.

2,486. Of the two classes of buildings he had referred to, viz., those built with country bricks and plastered, and those erected with moulded bricks which were pointed he considered that the former was cheaper by about 4 or 5 per cent., and that their respective cost of maintenance was practically the same. Plastering required renewal every four years, but not pointing, so the latter could only be repaired when its falling off was detected. On the other hand, if plaster fell off and was not instantly repaired both country and table-moulded bricks would deteriorate.

2,487. (*President*.) The construction of large buildings was formerly entrusted to a single contractor who was given contracts worth two or three lakhs of rupees. Recently, however, the Public Works Department had taken to constructing its large buildings departmentally and the terms offered were not sufficiently attractive to large contractors. The Civil Engineering College and the Kennedy Royapuram Hospital were being constructed departmentally, but all other work up to Rs. 20,000 or Rs. 30,000 was given to one contractor. The largest building that he had constructed was the National Bank and its cost was approximately Rs. 5,00,000.

S. D. PEARS, Esq., Chief Engineer, Public Works Department (*retired*).

Written Statement.

2,488. (I.) *Economy and suitability of methods of execution of public works.*—I think the methods at present adopted for the execution of civil works economical and suitable on the whole. They are doubtless susceptible of improvement in detail, but do not seem to me to require any important modification.

2,489. (II.) *Encouragement of other agency.*—As between execution by contract and execution by departmental agency I am, in theory, altogether in favour of the latter. For practically all works of an ordinary nature, the average Public Works Department upper subordinate is fully competent to fulfil all the functions of a contractor, viz., to negotiate with suppliers of labour (or with the labourers themselves) and with suppliers or manufacturers of materials, and to supervise work. And by so using the subordinate the contractor's profits are saved, the conflict of interests inherent in every contract is avoided, and your executing agent's interests become one with your own instead of being diametrically opposed to them; far greater liberty is secured to the employer to import any deviations he pleases; bad work more seldom occurs and can far more easily be pulled down when it does; and finally all trouble from law-suits or disputes is abolished. My own belief is, further, that the departmental method makes corruption more difficult, since it is more difficult, more risky, and more painful to self-respect for an overseer or supervisor to take a number of small gratuities from a number of small suppliers or labourers than from a single contractor.

(2.) In favour of the contract method it is urged that the contractor relieves government of risks. But the risks taken ordinarily by a contractor are, in the first place, in practice, infinitesimal; for whatever unforeseen contingency may arise in the way of war-prices, unexpected rains, unexpected water in foundations, unexpectedly long lead to a further quarry owing to obstruction from the owner of a nearer one, and the like, the contractor seldom or never fails to petition—and almost invariably with success—that government shall accept such accidents. And even if the contract is so carefully drawn as to affix all risks rigidly on to the contractor it is quite certain that he will quote sufficient or more than sufficient rates to cover the risk, and government has to pay after all.

(3.) A second and much stronger argument against the departmental method is that it is more trouble. It is, to some extent, a lazy argument, for if, as I believe, better quality and less expense are secured by the departmental method, it is well worth while, within limits, to face the extra trouble. It is also, to some extent, an illusory argument, for though the direct trouble—of accounting, bargaining, supervising, etc.—is no doubt greater under the departmental method, some deduction must be applied on account of the trouble saved in the way of calling for tenders, placing the contract, possibly cancelling and transferring it, disputes during progress and on final bills, and other such vexations.

(4.) The "more trouble" argument is, however, to some extent true. It has also a corollary which is undoubtedly of great weight in practice, viz., that, being more trouble, it requires a more numerous and more competent staff of upper subordinates to carry out the departmental method. Consequently, where there are a large number of small works scattered over a large area—a very common condition in this presidency—it may be quite impossible to post enough upper subordinates to carry them all out departmentally, and there is nothing for it but to carry them out by contract. But wherever there is a large work, or a group of works, for which a whole-time—or nearly whole-time—overseer can be made available, I should always advocate strongly the departmental method of execution in this presidency; and I should urge the Committee, so far from putting pressure on the Department to extend the use of private agency, to apply precisely the opposite pressure, viz., to limit strictly the use of private agency to those cases where it is quite impossible to use departmental agency.

(5.) It has been suggested to me that by the term "private agency" the Government of India have in view the introduction of a system under which a few large contractors—very much larger than those usually employed in this presidency—would undertake, to some considerable extent, the functions of the Public Works Department. If that is the intention, I can only say that my experience of large-scale private agency has been uniformly unfortunate. The only half-dozen or so of large-scale contracts (amounting in each case to several lakhs) that I have known of in this presidency, have all ended either in exorbitant expense, or in prolonged and severe trouble, or both. I may add that, as a "private agent" myself, I should not dream of undertaking any

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[Continued.]

large work or group of works except at rates far exceeding those at which government could work by small contract or departmentally.

2,490. (III.) Changes in organization.—If the Committee decide to recommend extension of the departmental method, it follows that an increase in the cadre of upper subordinates—and possibly also, to some small extent, of gazetted officers—will be necessary. Such increase would, no doubt, discount, in some degree, the financial advantage of the departmental method, but not, in my opinion, sufficiently to neutralise even the financial advantage. And the other advantages of the departmental method would remain.

2,491. (IV.) Relations with other departments and sub-branches.—The answer to the first clause of this question should perhaps be sought rather from the "other Departments of the Administration" than from any Public Works Department officer, past or present. As regards the relations *inter se*, the answer is in the affirmative, all the sub-divisions named being under one head and one roof.

2,492. (VIII.) Practical training.—I propose to offer three remarks bearing specially on English students.

First, that I should strongly urge far greater insistence on proficiency in the vernaculars, as an essential part of the practical course. Second, that a student should be given responsibility from the outset. And third, that for his practical course he should be attached to as senior an officer as possible—preferably a Superintending Engineer,—from whom he will be more likely to imbibe something of the wisdom and sympathy that should mark the good officer or subordinate than he is likely to acquire from a youth little older than himself.

2,493. (General.) With regard to the suggestion of the Government of India that the execution of unimportant works might be devolved on local bodies, I can understand that in provinces where the roads and buildings form a department distinct and separate from irrigation a good deal of travelling and time and establishment might be saved by getting rid of minor buildings—both original and repairs—to local bodies. But in this presidency there would be practically no such saving, and the principal result would be that as such works would be carried out by less efficient agency they would be carried out with less real economy and with less satisfaction to the occupying departments concerned.

MR. S. D. PEARS, called and examined.

2,494. (President.) The witness stated that he was a retired Chief Engineer of the Madras Public Works Department.

2,495. After retirement he had taken up private practice as a consulting architectural engineer and had during that period had considerable experience in the construction of private buildings, some of which had been erected by contractors and others under his general supervision, as consulting architect, with his own clerk of works.

2,496. The percentage of his establishment to works worked out to about 10 or 12 per cent., including the cost of his own office, designing and supervision. He could not state why the cost of establishment in the Public Works Department, Madras, was as much as 27 to 29 per cent., and stated that it was a matter which had always puzzled him when in government service. He had not, during his service with government, visited other provinces in order to examine the question.

2,497. In his opinion the departmental system of construction was the most economical and suitable for the conditions of Madras city, as well as for those of the presidency. He had recently completed two fairly large works by the departmental system at an approximate cost of Rs. 40,000 to Rs. 50,000 each and was commencing the construction of another in the same manner the estimated cost of which was between Rs. 50,000 and Rs. 60,000. He preferred to construct private buildings always by that means provided he had a suitable clerk of works. The salary of the clerks of works he had employed for the supervision of the two completed works he had referred to was Rs. 125—200 a month subject to a month's notice. Under the clerk of works was a *mistri* clerk, and the 10 per cent. allowance for establishment charges included the pay of both these men.

2,498. He had had some of experience of large contractors in connection with the construction of a few large works, one of which cost approximately Rs. 8,00,000 and two others about Rs. 4,00,000 each. Such contractors proved unsatisfactory in that they expected the rates, which were more or less Public Works Department rates, to yield about Rs. 1,500 or Rs. 2,000 a month to each member of their staff, which was unreasonable. They took up the contracts on tender and they had to underbid, or at any rate not much overdo, the rates of the local contractors in order to secure the work. Their rates and those of the local contractors were very much the same, yet they expected them to yield an unreasonably large profit. Furthermore, such contractors usually submitted long bills for "extras" and demanded exorbitant rates for them in order to secure their profit.

2,499. There were several water-works and drainage schemes under construction when he was Chief Engineer of the Madras Public Works Department but his personal knowledge of them was limited. They were not, as far as he could remember, given to large but to small contractors; in fact, 99 per cent. had been constructed by the latter. It was here pointed out to the witness that the Sanitary Engineer had stated that sanitary works had been constructed by large contractors and that only the engines required therefor had been supplied by a particular firm and he replied that, if the Sanitary Engineer had definitely made that statement, it was probably true in some cases. He did not agree with the suggestion that, provided it was permissible under the Code, the most satisfactory method of carrying out sanitary works in the province would be by entrusting the entire work to an individual firm. In support of his argument he cited the case of a large sanitary work he had constructed departmentally fifteen years previously, which had proved quite satisfactory.

2,500. He could not remember whether any government electrical work had been executed by electrical contractors, but was under the impression that a great deal of such work had always been executed departmentally and was still being so carried out. There were two reliable firms in Madras through whose agency he carried out electrical work and two others who carried out sanitary work. He thought that the reason why reliable European contractors were not obtainable for the building portion of his works was that they could not enter into competition with Indian contractors who could work at much cheaper rates. As a matter of fact the European contractor was generally only a middle-man who employed petty contractors to carry out the building work.

2,501. Generally speaking the rates paid by private owners for building work were slightly higher than those paid by the Public Works Department; indeed he himself sometimes found that his rates were very much higher than departmental rates. Striking an average, however, he thought that the private rates were roughly 5 per cent. higher than those of the Public Works Department.

2,502. For the private building work he had supervised in Madras, the contractor engaged generally supplied his own materials, including bricks and lime, but excluding electrical and sanitary fittings. He thought this was a satisfactory method, but not as satisfactory as dealing direct with brick and lime manufacturers.

2,503. He considered it was necessary, in Madras, for government to manufacture their own bricks and burn their own lime as it had a very healthy effect on the private rate. The government rate for bricks in Madras was always lower than the market rate, and had govern-

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[Continued.]

ment not had their own brickfield, such bricks as they would have been obliged to obtain from outside sources would have been more expensive. He did not quite agree with the contention that it was possible to obtain in the open market as good bricks as those made by government if not better. The difference between the two rates was slight but he thought that private bricks of the same quality were considerably more expensive. The government rate for bricks at present was Rs. 13 per thousand and took into account works establishment and supervision as well as, he believed, the interest on money lying idle, and he expressed himself as doubtful whether it was possible to obtain private bricks of the same quality for even Rs. 15 or Rs. 16 per thousand.

2,504. With regard to the comparative efficiency of the Public Works Department officer in the management of labour, and that of the contractor who had greater experience in that direction, he did not think that he had ever met a Madras contractor who was accustomed to the handling of labour of any magnitude. It was a fact that a regular class of contractors did not exist in the Madras Presidency as there were very few people who made contracting a profession. Sometimes a retired accountant, overseer, or other departmental subordinate would enter into partnership with people who possessed money, or the retired accountant would be the financier and enter into partnership with a retired *mistri* and take up contracting work, but neither had any ripe experience in the matter nor did either partner persevere with contracting for very long. He did not think that a building contracting firm would be able to purchase and arrange for the supply of materials any better than a Public Works Department officer. There were very few men in Madras city who could point to a career as contractors of 10 years' standing. He had recently asked a man to take up a contract for one of his buildings, but the individual he approached had actually given up contracting work as he considered it was not worth the trouble, and he knew of several other individuals who were of the same opinion. A considerable number of buildings in Madras had in the past been constructed by individual contractors, but there were no satisfactory contractors available at the present time. For example, for the construction of two large buildings, one a hospital in Royapuram, and the other a stationery store, at an estimated cost of about Rs. 5,00,000 each, tenders were called for, but as those received were not promising he could not accept them. Consequently, he decided to construct the buildings departmentally and this had been done quite satisfactorily. He advocated the departmental system for the construction of buildings in Madras because he considered it was best. He did not know whether this system was followed in other countries.

2,505. He was opposed to the extension of the employment of local board agency because he considered it would be less efficient in respect to the construction of buildings than the Public Works Department. It was true that the staff of the latter were better paid than that of the former, that a large proportion of the work of the Public Works Department in connection with the construction of buildings in the presidency was petty from an engineering stand-point, that it was work which in fact did not really require an efficient engineering staff, and that the qualifications of the district board staff were sufficient to enable them to deal with all ordinary buildings and roads work in the district. But the objection to handing over additional government buildings to that staff was that they would not be maintained to the satisfaction of the occupying department owing to the staff of the district board being less competent than that of the Public Works Department. It would also add to duplication of travelling since the Public Works Department officers, in the course of their other duties, had constantly to pass through the towns and villages in which such works were situated and it was at present a very slight addition to their duties to have to look after them.

2,506. He was under the impression that the justification for the employment by Collectors of districts of separate establishments of low calibre for the main-

tenance of minor irrigation tanks was that these tanks, and other small irrigation works, required only such establishments to look after them. The system involved a certain amount of duplication, and was in fact faulty in that the tanks were not economically maintained, but he was not able to suggest a better one.

2,507. It was very difficult to state the proportion of government to private buildings in Madras, because of the numerous small buildings being erected in the city and the fact that government activity varied greatly from year to year. He thought, however, that the proportion of government buildings was perhaps smaller than that of private buildings, if the Stationery Stores, and the Engineering College which were outside the city were not taken into account and that if they were that the proportion of government buildings would be increased thereby.

2,508. He did not think that if in the interests of the government the Public Works Department followed the departmental system of constructing buildings, it would prejudicially affect private requirements. For instance, it would not handicap a private individual who desired to construct a house. His impression was that the private owner employed a small contractor, that is, a man who was probably merely a supplier of bricks and who would arrange for the execution of the work. If the departmental system were *universally* introduced throughout Madras, he thought that the private owner who intended to construct a house might possibly be handicapped, but he did not consider the universal introduction of the system was feasible. His recommendation in the matter had reference only to the larger buildings and hence a good deal would be left for construction by other agency. If reliable firms had been available in Madras, he would have been able to carry out work more easily and efficiently, but their absence was not the result of the introduction of the departmental system. As a matter of fact the converse was the case, as he had introduced the departmental system in Madras because there were no contractors available. Prior to the introduction of the departmental system, the bulk of the public works in Madras were entrusted to small contractors who, even at the present time, were carrying out most of the building work in the city, and the main reasons for the absence of reliable contractors in Madras was that the Public Works Department rates were not sufficiently attractive, and that the Public Works Department procedure was intricate, cumbersome and dilatory.

2,509. For the construction of government buildings government insisted on contractors using their bricks and lime only to the extent that those materials were available. He had found that the quantity of government bricks was not sufficient for requirements and that consequently a certain proportion had to be purchased in the open market.

2,510. In his opinion, government had not encouraged the growth of reliable contracting firms as they might have done and had not accorded them sympathetic treatment. The competition amongst contractors in Madras was very keen. For example, for the construction of a building costing Rs. 15,000, between five to twenty tenders would be received out of which probably ten would not quote rates at all, but simply intimate that they were prepared to undertake the work for 10 per cent. less than the other tenderers, and tenders of this description were, of course, never accepted. As a result profits were cut down to a minimum and compelled men to abandon the trade as unprofitable. Small contractors of the retired *mistri* class and others were constantly springing up. As an example he quoted a recent case in which a large contract had been given to a retired accountant who knew nothing whatever of building and stated that he probably had the work done by a *mistri* whom he financed.

2,511. (Sir Noel Kershaw.) The Public Works Department schedule of rates was, on the whole, too low, and was not prepared with sufficient care; it was also not up-to-date. There was no schedule of rates for the entire presidency, but 30 or 40, *viz.*, one for each division, each of which sometimes related to three or four subdivisions.

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[Continued.]

2,512. He had not, when in government service, considered the question of the establishment charges of the Public Works Department, and could not suggest any means for their reduction though it had occurred to him from time to time that they were high. He had also not considered the question since his retirement but could see the difference between the Public Works Department establishment charges and his own. There could be no doubt that, if he were obliged to deal with many scattered works, it would increase his 10 per cent. rate, but as a matter of fact he had some works in progress in different parts of the presidency which had been taken into account when calculating the percentage.

2,513. His building works were fairly large, but were works of the second rather than of the first magnitude. If instead of such works he was obliged to construct a number of small scattered ones, he would have to engage a larger establishment. For his present needs, however, a supervisor for every one or two works and some *mistris* were sufficient.

2,514. In explanation of the rate of Rs. 34 per 100 cubic feet charged for coursed rubble masonry in the construction of the Bank of Madras, Coimbatore, as compared with the rate of Rs. 17 per 100 cubic feet shown in the Public Works Department schedule of rates for a similar class of work, he stated that the departmental schedule was not always reliable and differences frequently arose. The difference of 50 per cent. between the two rates could not have been due to a misprint in the schedule because there were other similar items which were equally unreliable. Cases frequently arose in which the schedule of rates and the facts did not coincide, and therefore one could not be entirely guided by the schedule. When he was in government service it was rather the exception to have excesses but those which did occur referred principally to estimates for establishment and surveys and accordingly had no reference to the schedule of rates.

2,515. The witness claimed that by resort to the departmental system bad work very seldom occurred and could be more easily pulled down when it did. It was also the case that under this system work which had to be re-done, for reasons other than bad workmanship, would be debitable to the owner. On the other hand the cost of reconstruction of bad work by a contractor would be met by the contractor.

2,516. With reference to the statement in paragraph 2,489 of his written evidence in connection with the risks taken by a contractor that he 'seldom or never fails to petition and almost invariably with success' he explained that the authority to whom the contractor petitioned varied according to circumstances. If, for instance, it was an important matter the case would be submitted to a high official, but minor petitions were submitted to either the Executive Engineer or sub-divisional officer, who generally out of pity and sympathy would uphold the contractor. The guiding factor to his mind in cases of this kind was that the contractor should carry out a contract in the way he interpreted it, that it was not fair to place him in a position which might result in heavy losses or his bankruptcy.

2,517. He thought that corruptibility could be purchased by the payment of a sufficiently high price, but it would take a very high price indeed to root it out altogether. He did not think that if subordinates were given a better wage the actual cost of works would be less. Incorruptibility did not appreciably effect the total expenditure on a work, but it was extremely easy to get a low-paid subordinate to pass bad work.

2,518. (*Mr. Mackenzie.*) In cases in which he designed a building for a client and supervised its construction he employed a clerk of works, but neither this man nor the contractor engaged attended to the technical details. As a matter of fact, none of the contractors he had dealt with in Madras employed their own engineers, and in the

construction of dock works contractors were obliged to leave the technical details to trained engineers.

2,519. He thought it would be useful if the Accounts Department and the public were informed how the superior establishment was employed, but he did not think engineers were very much interested in the matter, and he was not at all sure whether the Accounts Department would be able to understand it. All the Accounts Department were furnished with was a return showing that a certain sum of money had been spent, but they had not the least idea, nor could they have, whether it had been spent on actual work, or, for instance, on surveying.

2,520. He did not think that, if government bricks were sold to the public, they would charge the latter an additional 25 per cent. In his opinion people should be made aware when they were being charged extra for bricks, but they could not know unless somebody disclosed the details. It would be beneficial if the Accounts Department attended more to its legitimate duties than to the pointing out of trivial mistakes, but the question was one more for the consideration of that department.

2,521. The rates for stores in stock had been known to be more than double the ordinary rates, and the Examiner who noticed this could not assign any reason for it; it would certainly be a good thing for the Examiner to find out the cause which, as a matter of fact, was part of his duty.

2,522. (*Mr. Cobb.*) In cases where a considerable excess was incurred over the original estimates, a large portion of the excess was sometimes due to a change in the rates. The Public Works Department constructed buildings according to their schedule of rates and portions of the extra cost would thus be due to excesses over the scheduled rates. The statement explaining the reasons for excesses was rarely looked into by the Chief Engineer for want of time and generally contained more plausible than well-founded reasons for excesses. Hence it was not possible to ascertain from it exactly to what extent rates had been exceeded. From his experience he thought that the large contractor offended most in the matter of exceeding his rates and was also more persistent in demanding concessions than the small contractor.

2,523. (*Mr. Howley.*) The Public Works Department schedule of rates required revision each year, but such revision was not always carried out. The schedules had to be submitted to the office of the Chief Engineer but this was merely for the Chief Engineer's information and it was the Superintending Engineer who really fixed the schedule rates. There was no tendency to keep the rates in the schedule below the actual cost of construction because the schedules were not properly revised. In fact sufficient attention was not paid to the schedule of rates which, however, was not a document of very much importance. The items in an estimate which were habitually below the average actual rate amounted to about 3 or 4 per cent.

2,524. As a general rule the Public Works Department rates on the whole were too low to be attractive to contractors, and this accounted to a certain extent for the high percentage for departmental charges.

2,525. It was rather difficult to say whether the expenditure of, say, Rs. 50,000 on the maintenance of a road would require as much supervision as the expenditure of a similar amount on a number of scattered buildings. The chief expenditure in the case of a road was the collection of road metal which, however, did not require very much supervision.

2,526. (*President.*) He did not agree with the statement that in Bombay the percentage of establishment charges was high because it included a large expenditure on roads on which supervision charges must necessarily be high; nor that the Madras establishment charges were high because they included buildings and excluded roads.

HORMUSJI NOWBOJI, Esq., A.M.L.C.E., Sanitary Engineer to the Government of Madras (*retired*).

Written Statement.

2,527. (I) Economy and suitability of methods of execution of public works, and (II) Encouragement

of other agency.—The comments and suggestions contained in this statement are with reference to conditions prevailing in the Madras Presidency.

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[Continued.]

(2). Much of the work executed by the Public Works Department is at present done departmentally with the help of petty contractors for the supply of materials. Piece-work contractors are also employed to execute small works and also larger works in parts. This method of executing works is more suited for contractors with small capital. It enables a large number of contractors being employed on a single work. Payments are more frequent and much quicker than is the case with regular contracts, which permit of payments being made only for completed work. The petty and piece-work contractors do not incur any responsibility for the soundness of the work as the regular contractors do. All iron-work, machinery and building materials of foreign manufacture which the Department requires are obtained by indent on the Director-General of Stores, India Office.

(3). The method of executing works described above has its advantages as well as its drawbacks, but it was no doubt devised or shaped itself suitably to the conditions which existed when the Department was first formed. There were no civil engineers in private practice. There was a lack of suitable contractors for the construction of works,—contractors of sufficient knowledge and experience and the requisite capital,—and there were not many firms engaged in the manufacture or importation of iron-work, machinery and of such building materials as are unobtainable in India. Under these conditions works had to be carried out departmentally and machinery and materials had to be obtained from England through the India Office.

(4). Conditions have changed to a considerable extent within the past quarter of a century. Much of the construction work on railways is now done by contractors. Contractors are also employed to an appreciable extent throughout India in the construction of buildings connected with industries of all descriptions and even in the erection of private residences. With regard to civil works executed by the Department there is one circumstance which is opposed to the possibility of private enterprise ever supplanting departmental work wholly. Most of the works executed by the Department are of small value individually and are scattered over an enormously large area. A contractor, employed on a small section of a railway under construction or in the erection of a large building for a cotton mill or mercantile office, has sufficient work to absorb his activities and resources. But in the case of works under the Public Works Department a contractor would have to spread his operations over a very large area, and the work would not pay him unless he was given higher rates.

(5). For reasons given above the departmental system is economical and suitable for the execution of small works, to which most of the expenditure in the Department is devoted.

(6). The contract system has much to recommend it in the case of large works, the advantages accruing therefrom being rapidity and quickness of execution and the responsibility of the contractor for the soundness of the work. A common complaint against departmental work is that it is slow as compared with work executed by contractors on railways and for private employers. A quality which is essential in the execution of works is organizing capacity. A contractor who has learnt his trade by employment on the construction of works from his youth acquires the quality of organization more than a man trained in an engineering college. A successful contractor of high reputation whom I knew had risen from the position of a *mistri*. When contractors having the necessary experience and standing are available, the work done is of a quality comparable with that turned out by the Department. I have been associated in one way or another with the design and construction of large water-works in this presidency, including those of Madras, Madurai, Trichinopoly, Tanjore, Conjeeveram, etc. These works were carried out by contractors, a work costing rupees 3 or 4 lakhs being often carried out by a single contractor. The quality and soundness of these works does not suffer by comparison with water-works executed latterly by the Public Works Department. It is idle to expect a contractor to do good work unless his rates

are fair, and will allow of a margin of profit with honest work. If fair rates are given, contractors with the necessary experience and capital would be forthcoming. A large railway contractor, a Parsi whom I knew, was himself an engineer and a Member of the Institution of Civil Engineers, who employed a large qualified staff under him and prepared his own working drawings. Not infrequently a contractor is merely an enterprising capitalist with no previous experience of the work. It is the unsatisfactory work of such contractors which has brought discredit to the contract system in the Department. The matter could be remedied if it were invariably stipulated as a term of the agreement that the contractor should himself possess a knowledge of engineering or employ an assistant with engineering qualifications. The contractor would be able to secure such men from the retired officers of the Department. Retired men of the Department have found employment in such capacities before this. Retired officers of the Department would also be willing to undertake contract work, but their difficulty is very often the want of the necessary capital. My suggestion is that government should advance the money if they are satisfied as regards the capacity of the officer to undertake the work. The pension of the officer would be the security.

(7). A more extensive adoption of the contract system would stimulate private enterprise, would give more scope for men who pass out of the local engineering colleges, would foster a spirit of self-help and independence in a class of men who now look solely to government employment for their livelihood, and thereby raise the prestige and dignity of the profession in India. In Bombay a good number of men trained in the Poona Civil Engineering College have set themselves up in private practice as architects, engineers and builders and are doing profitable business. In Madras people are also beginning to realize the advantage of employing engineers to design and supervise the construction of private buildings including dwelling houses. By a more extensive adoption of the contract system government would be widening the field of activity for engineers engaged in private works.

2,528. (V.) Decentralization.—Another change by which private enterprise can be encouraged is the relaxation of the rule prohibiting the local purchase of foreign-manufactured articles. The conditions of supply of such articles in India have changed. Several English manufacturers of machinery and engineering requisites have opened branches in India; others are represented by local engineering firms. The time has arrived for some change in the rules which govern the purchase in India of articles of English manufacture. Under the existing rules no such article, however small its value, may be ordered out from England either direct from the manufacturer or through local agents by any officers of the Department without the sanction of government. Articles of English manufacture available in India may be purchased only in an emergency, when the work is likely to be seriously delayed by their absence, subject to the limitation that no article of a value exceeding Rs. 2,500 may be purchased without the sanction of the local Government.

(2). I would increase the Superintending Engineer's powers of sanction with regard to articles of English manufacture from Rs. 2,500 to Rs. 10,000, and do away with the distinction now observed between articles in stock in India and articles not in stock in India at the time of ordering. It not infrequently happens that, though merchants usually stock the article, they are out of stock at the moment of receiving the order. My experience is that articles of stock pattern can usually be obtained more quickly and at less cost from the local branches and agents than through the India Office. There is also freedom from risks of damage and breakage during transit in the former case, and there would be less difficulty in returning a defective article or one not according to the specification. In the case of large orders for machinery and materials which have to be made for some special purpose and according to a special design or specification and have to be examined and

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tested before shipment there are obvious reasons for obtaining them through the India Office.

2,529. (VII.) Education, and (VIII.) Practical training.—A common complaint against locally-trained engineers is that, though well up in theory, they are deficient in practical knowledge. The imputation is not groundless, but the deficiency in practical knowledge is not due to any inherent inaptitude of the Indian. It is largely due to the inadequate system of education and training for engineers in India. Some valuable suggestions for the improvement of the education and training for engineers may be gleaned from a report by a committee appointed by the Institution of Civil Engineers in 1903 to consider and report on the subject. The committee has emphasized the value and importance of practical training to the engineer. The committee consider that a boy intended for the engineering profession should have a preparatory education best suited and most helpful to him in his studies for the profession at the engineering college and such preparatory education should include geometrical and free-hand drawing and work in the nature of handicraft such as carpentry, turning and fitting, that engineering colleges should be fully equipped with workshops and laboratories for the demonstration of the scientific and technical instruction which students receive, and that the college course should be followed by practical training under commercial conditions and by a considerable period of apprenticeship in engineering offices, workshops and on works under execution. In this respect the training in the local college of engineering is deficient. It is not practicable to make provision in Indian schools for the preparatory course indicated above, owing to the small number of students entering the engineering college.

(2). In the recommendations I make for the better education and training of students and for improving the usefulness of the local college, the chief considerations have been that it was necessary to devote more time and attention to practical training, that it was undesirable to impart instruction in any branch of engineering for which the college was not fully equipped and that it was necessary that the curriculum be devised suitably to the nature of the work engineers have to do in India. In the Madras College of Engineering there are two sections (1) civil, (2) mechanical. The course of instruction in mechanical engineering as a separate section should be abolished, as it has been of no utility to the students who have gone through it. Though this course was introduced as far back as 1890, hardly any of those who have gone through it have devoted themselves to mechanical engineering after passing out of the college. As a matter of fact nearly all of those who have obtained diplomas in mechanical engineering are now engaged in civil engineering, and are doing identically the same work as the diplomaed civil engineers. To employ men in a capacity for which they were not trained is a most anomalous state of things, and detrimental alike to the interests of the Department which employs them and the men themselves who have been deluded into taking the course in mechanical engineering.

(3). Students who enter the college now realize that the study of mechanical engineering is of no practical value to them and consequently only a few of the students take up the subject, as will be seen from the following statement of engineers who obtained diplomas from 1911 to 1914.

	1911.	1912.	1913.	1914.
Civil engineers	15	14	15	13
Mechanical engineers	5	2	1	2

A large staff is employed at the college in teaching mechanical engineering. Under the circumstances stated above this is a useless expenditure of money. The mechanical engineer is essentially a product of the work-

shop. Four years at the college and one year in a workshop is not the right way of training mechanical engineers. The college is not well equipped for the adequate training of mechanical engineers. In the present condition of the industrial development of the country there is not much field for the employment of scientifically trained mechanical engineers. If ever a demand for such men arises, their education and training will have to be on lines altogether different from that followed at the college.

(4). While on the subject of mechanical engineering I might say that some knowledge of it is useful even to the civil engineer, and the subject should be taught to this extent; but a separate independent course for training mechanical engineers is not justified. The instruction and training at the college in civil engineering should be on broader lines than the present curriculum. More importance should be given to the study of the technic of engineering which to the ordinary engineer is more useful in practice, than a high proficiency in abstract sciences like mathematics, physics, chemistry, geology, etc. I do not underrate the value of such sciences to the engineer, but it is a mistake to devote much time to these subjects at the expense of more practical subjects, as is the tendency now-a-days. The instruction at the college should be of a more varied character and of wider scope, so as to include all branches of civil engineering, problems which the Indian engineer may have to deal with in his professional career, such as municipal and sanitary engineering, harbour and river navigation, railways, etc., in addition to the subjects now taught at the college. I have already referred to the need of some knowledge of mechanical engineering to the civil engineer. The students should be required to attend all these special courses which need not be very extensive.

(5). In India conditions are not favourable for specializing and devoting oneself to one particular branch of engineering, except in very rare cases. The work of the Public Works Department engineer is very varied in character. He may at one time be engaged on irrigation work, at another in charge of a workshop, next perhaps designing and executing drainage and water-works or investigating harbour and river navigation problems. The civil engineer in India must possess a general knowledge of all branches of engineering in which his work may lie. I would lay much stress on the necessity of a special course of instruction in municipal and sanitary engineering. It may any day devolve on a locally-trained engineer, whether he is employed in the Public Works Department or in a municipality or under a district board or railway department, to design and execute works of a sanitary nature. There is much activity at the present day in the provision of works for the amelioration of health and sanitation. The value of the larger of such schemes designed by the Sanitary Engineer to Government, Madras, during 1915, amounted to Rs. 40 lakhs, and the value of minor works designed by the officers of local bodies totalled Rs. 20 lakhs.

(6). The foundation of the practical training should be laid at the college. As regards the time relation between practical training and theoretical instruction, I am of opinion that the best arrangement will be to undertake both concurrently, the mornings being devoted to practical work and the afternoons to class work. After the student leaves the college he should devote one year exclusively to practical work as at present. The practical instruction in mechanical engineering should commence with carpentry and fitting work, and then proceed to more important work in the college workshop. The practical knowledge of other branches of civil engineering should be acquired by spending two or three mornings a week on works under construction.

(7). It may be urged that it is not possible to teach more subjects and do more practical work at the college than at present, and, that if more were attempted, the students would have a more diffused knowledge with less perfect attainments in individual subjects. Judging from my own experience at the college when the course was of a two years' duration, I think the subjects of study in a four years' course, with a well-planned system of instruction

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and efficient teaching staff, can be increased without any detrimental results. The number and variety of subjects studied and the amount of practical knowledge acquired by Indian engineers who have studied in England in a course of 3 or 4 years is very extensive.

(8). The lecturers and instructors at the college in engineering subjects should be engineers with considerable Indian experience. A young man who has just left an English university with a degree in engineering, however high his credentials, is not the right sort to be a professor in an Indian college of engineering. A sufficiently large number of competent engineers, both European and Indian, who are compelled to retire under the age rule, could be found to take up professorial work at the college for a term of 5 years. Others may be willing to retire even before they attained the age of 55 to take up an appointment in the college. By adopting this course the students will have the benefit of tuition from engineers of ripe experience, and the change of professors every five years would render instruction more up-to-date than it is with professors with small engineering experience which does not improve with age as long as they remain at the college.

(9). There is one more suggestion I have to make, which is not irrelevant to the present inquiry. It is a matter of common observation and one of regret that the vast knowledge and experience which engineers in India

possess does not benefit the younger generation of engineers. It runs as if it were to waste after the engineer retires. In European countries there are societies for the promotion of the knowledge of engineering, at which papers on professional subjects are read and discussed, thereby enabling the members to help one another to enlarge their knowledge and experience. The papers and the discussions which follow find a permanent record in the organs and publications of the societies which become a valuable store-house of knowledge. To the rising generation of engineers this record and experience of the work of their elders is of countless value. I think government might take steps to induce and encourage the formation of such societies in all the provinces. The chief obstacle in the creation of such societies is a monetary one. It is suggested that government should help the societies with money grants. Any measure which is calculated to improve the knowledge and experience of the engineer is in the interest of the government. Government should also encourage the publication of works on Indian engineering by publishing the first edition of an approved work at government cost. The profit, if any, on the sale of the works should be given to the author, and he should be at liberty to print and publish the subsequent editions elsewhere, if he desires to do so.

Mr. HORMUSJI NOWROJI called and examined.

2,530. (President.) The witness stated that he had received his engineering education in the Madras Engineering College, that he had retired from the Public Works Department after a service of 26 years, and that he was in receipt of a pension.

2,531. Towards the latter part of his service he underwent a specialized training on sanitary works in England for a period of two years. After three or four years' service on the Madras drainage works he was appointed Assistant Sanitary Engineer to Government.

2,532. He considered that departmental construction was most suitable in the case of small scattered works but though he did not think the contract system was the best method of construction for large works at present, he anticipated that its encouragement might eventually prove it to be the best. He added that the departmental construction which he advocated for small works could be carried out by petty contractors or departmental labour, and did not think that the Department would experience difficulty in carrying out small scattered works departmentally as such works were at present executed either by such agency or by petty or piece-work contractors.

2,533. The Madras Sanitary Department was created in the year 1890, and up to the year 1907 the Sanitary Engineer constructed as well as designed all sanitary works, when the construction of such works was transferred to the Public Works Department. When the construction of sanitary works was in the hands of the Sanitary Engineer, large contractors were asked to submit tenders for each work. As instances of such cases he cited (1) the Trichinopoly water-works, the construction of which cost about Rs. 6,00,000 and was entrusted to a Coimbatore contractor who, except for the iron-work, executed everything else, e.g., the head-works, river works, engine house, etc., and (2) the construction of the Madras water-works where a single local contractor did masonry work for about Rs. 8,00,000 or Rs. 9,00,000. In his opinion large contractors executed work satisfactorily and at a reasonable cost.

2,534. In explanation of the reason for the transfer of sanitary works to the Public Works Department, he quoted the words of the Chief Engineer for the time being, viz., "even with the best will in the world, he (the Sanitary Engineer) was not able to supervise the construction of a large number of works scattered over a large area of the presidency", and added that at that time there was only one Sanitary Engineer with a Sanitary Assistant, which latter post he had held. He admitted, however, that this establishment was indirectly supplemented by the employment of temporary executive

officers on various works, but remarked that such men ranked as Assistant Engineers only and were employed temporarily for the execution of each work, and government considered they were left too much to themselves. A further reason for the transfer was that Public Works Department officers were unwilling to be attached to the Sanitary Engineer's office as they thought they would lose touch with their own department and thus prejudice their prospects, and though the Sanitary Engineer frequently endeavoured to secure the services of such men, the latter were always unwilling to accept appointments in the Sanitary Department. Hence the system underwent a change and thereafter the Sanitary Engineer became only the designer of schemes, their actual execution being carried out by the Public Works Department. Under the changed conditions it was not even necessary for the Sanitary Engineer to do inspection work and he only did such work when he was asked to do so by an Executive Engineer who was in difficulty.

2,535. So far as he was aware large contractors had not been engaged for the construction of sanitary works since the year 1907, the date of transfer of these works to the Public Works Department. It was his personal experience that large contractors were competent to construct such works and that they were capable of doing as good work as was done under the departmental system. He based his statement on the fact that he had employed large contractors for the construction of about seven water-works.

2,536. He was resident in Madras, but had not taken up private practice since his retirement though he had been offered two or three private works.

2,537. He considered that there was no longer any need to retain the supply of materials, e.g., bricks and lime, in the hands of government as many private persons had taken to manufacturing bricks during the past five or six years; among them was a European firm which had a brickfield of its own.

2,538. He had found that the rules for the supply of European stores hampered him considerably when he was Sanitary Engineer particularly in cases where an article was needed very urgently, and considered that an article such as a 10 horse-power engine could be obtained more cheaply and quickly locally, but that for large indents, e.g., an indent for 500 tons of pipes, or an engine for a large water-works, the India Office was the best source of supply. The reason for the latter recommendation was that special engines were required for large water-works, and that they were not at present manufactured in India. He added that no benefit

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would be derived if large orders were placed with Indian firms as the profits would be absorbed by middlemen.

2,539. There were no firms of sanitary engineers in Madras, and a branch of a Bombay firm of sanitary engineers saw to the sanitary fittings in the Legislative Council Chamber building at Fort St. George. There were, however, private firms who supplied sanitary materials.

2,540. He acknowledged that the criticism in his written statement against the engineering education imparted in India was largely influenced by his belief that the general standard of education in India was unsound, inasmuch as the secondary and high schools were much too literary, with the result that engineers did not obtain sufficient practical training. He desired the removal of this disability, but realized that it was unfortunately not possible to alter school curricula to suit the needs of the few men who took to engineering. The qualification at present laid down for admission to the Madras Engineering College was the intermediate arts examination and he considered that this might be lowered so as to admit of students commencing their study of engineering at an earlier period of life, and that an elementary course in engineering might take the place of the two years at present occupied in preparation for the intermediate arts examination. With this in view he suggested that admission to the college might be made permissible to those who had passed the matriculation, and the substitution of a course of five or six years for the present four year one, and the giving of a concurrent theoretical and practical training. Judging from his own experience he considered that a feasible and satisfactory method of giving students practical instruction, along with their theoretical training, would be to allow them to devote their mornings to the inspection of works and their afternoons to book-work, and he expressed a preference for this method to a theoretical training of six months in the year followed by continuous practical instruction for the remaining half of the year. He adhered to the contention in his written statement that too much science was prescribed in the present course and suggested that it might be modified in this respect and a fair amount of instruction in municipal and sanitary engineering included, as the present course did not embrace even the elements of these subjects.

2,541. He did not approve of the present method of recruiting professors for the Madras Engineering College from England, as, in his opinion, the teaching staff ought to possess Indian experience. He suggested their replacement by retired Public Works Department engineers who, though not adapted as a class for teaching, had more practical experience than the present professors. In his opinion, many retired officials were fitted for work after the age of 55, and government should profit by giving them the opportunity of imparting the knowledge they had acquired in government service to the students in a college even though there would then

be the disadvantage of a great disparity in age between the students and their teachers. In the event of retired officials not coming forward he advocated the deputation to colleges of efficient Executive Engineers from the ordinary Public Works Department. It was true that the latter arrangement might lead to an attempt on the part of the Public Works Department to thus free itself of inefficient Executive Engineers but there was little likelihood of such a contingency as the Director of Public Instruction would watch the interests of the colleges. He presumed that even an Executive Engineer who was keen on his work would be willing to devote five years of his service to educational needs, from the fact that, at present, there were occasional appointments of Public Works Department men. In conclusion he recommended that the pay of professorial appointments should be raised, and proposed that professors who were drawing Rs. 700 a month might be paid Rs. 1,250 a month.

2,542. He advocated the formation of an engineering society in Madras as the presidency did not at present possess either a civil or provincial engineers' association, and considered that government should provide the funds for its inception as it was not possible to obtain a sufficiently large number of members to start such an association, or even to establish a library for engineering publications, owing to the lack of interest evinced by engineers, in Madras, in the movement. The obtainment of suitable publications he thought could be ensured by the appointment of a committee of publications or by leaving the selection to the Chief Engineer. He admitted, however, that if his suggestion took definite shape government would suffer all the loss sustained, while others would reap the benefits.

2,543. (*Mr. Cobb.*) It was not impossible to obtain a suitable teacher for an engineering college who was 55 years of age. Teachers for ordinary high schools in India had to undergo a training, but he did not think it was as difficult to teach students of engineering colleges as it was to train teachers for high schools, as engineering students were, in his opinion, a more intelligent class and were not puerile in their ideas. He expressed himself as in favour of the appointment of teachers who were about 50 years of age.

2,544. The expression "if fair rates were given to contractors" was used in his written statement as it was generally known that the Public Works Department rates were too low, and he personally was of the same opinion after a comparison of the rates with those of railways. When once engaged on a water-works scheme he tried to secure a large railway contractor from Bombay for the work and that man when he was shown the Public Works Department rates had remarked that they were too low. In the circumstances he considered that the Public Works Department rates should be increased and brought up to the same level as railway rates.

At Madras, Thursday, 22nd February 1917.

PRESENT :

F. G. SLY, Esq., C.S.I., I.C.S. (*President*).

SIR NOEL KERSHAW, K.C.B.

C. S. COBB, Esq., M.V.O.,

A. T. MACKENZIE, Esq.

And the following Co-opted Member.

W. J. J. HOWLEY, Esq., A.M.I.C.E., Superintending Engineer, Public Works Department.

D. G. HARRIS, Esq. (*Secretary*).

C. T. MULLINGS, Esq., Superintending Engineer, Public Works Department.

Written Statement.

2,545. All government and public bodies keep records of the rates tendered by contractors, and prepare

schedules of rates annually, based on market prices and recent tenders, from which the estimates for new works are framed. Municipalities, district boards, minor

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irrigation departments under the Revenue Department, and Public Works Department divisions submit these schedules annually to the Superintending Engineer for approval. In the sixth circle of which I am in charge, the scheduled rates are now practically the same for all these services in the same place. This means that all government and public bodies pay contractors the same rates, so Public Works Department work is not more expensive than that of other departments and local bodies. In my opinion, Public Works Department work is better than that of any other local bodies, probably due to their supervising staff which is larger and better paid.

2,546. Experience shows that establishment cost decreases as the size of work increases. For example, in a Rs. 58.4 lakh dam being built departmentally in Hyderabad State, and with which I was recently connected, the cost of the engineering establishment is under 11½ per cent. of the cost of works and only 8 per cent. of the gross cost of the finished reservoir. If the medical establishment, including hospital and sanitary staff and police guards are included, the whole staff cost 13½ per cent. of the cost of works and 9½ per cent. of the completed reservoir. These percentages cannot be considered high. (In the reservoir in question such items as land compensation, machinery, tram-line and rolling stock are included in the gross cost of the dam but are not included in the cost of works which only amounted to Rs. 39.7 lakhs.)

2,547. On important roads and in large deltas where maintenance is nearly continuous throughout the year and supervision easy the cost of the supervising staff is also fairly low. Even the short Public Works Department ghat road to Kodaikanal does not cost 25 per cent. for all forms of Public Works Department establishment, so district board roads are not expensive in staff employed.

2,548. The establishing of district boards in this presidency took away from the Public Works Department most roads and a certain number of minor buildings such as cattle pounds, schools and dispensaries but it left the Department with all its most isolated and least accessible works, that is to say the smaller irrigation works scattered all over the country and only accessible by unbridged and unmetalled cart tracks. Even to inspect such a work, take levels, and prepare an estimate may cost in the occupied time of the subordinate, his survey lascars, and his sub-divisional officer (i. e., in pay and travelling allowance) an amount equal to the estimate when framed, and it is possible that when it is submitted the estimate may never be sanctioned on some ground of general policy. The cost of the establishment so employed is divided among works which are constructed and is not quite fair to them. The majority of Public Works Department works in Madras are of this small class.

2,549. Further, the Public Works Department services are often given free to district boards and other bodies. In the past few months I and my staff have investigated the provision for waterways in the estimates of two proposed district board railways where some of the drainage basins were in unsurveyed *zemin* tracts, also we have checked and revised plans and estimates of several important road bridges, causeways, schools, *chattrams* and done similar work for the minor Irrigation Department which works under the Revenue Department. We have checked all municipal and other rates schedules and we are building a *dharamsala* at Rameswaram from money contributed by a wealthy Northern Indian free of establishment cost. If the cost of our time so spent were charged to the public body concerned (as might be considered reasonable enough) our establishment charges would be much reduced.

2,550. Therefore the fact that the Public Works Department establishment costs about 25 per cent. of the value of the works they construct is an arithmetical calculation from which other inference should not be drawn. Paragraph 7 of the despatch suggests that Public Works Department work is expensive which I cannot admit.

2,551. The rates for labour all over the world are rising fast while the salaries of the professional classes are stationary or rising only very slowly. It follows from this that the cost of establishment relative to works will fall. In 1908 the pay of the higher grades of the Public Works Department was raised very considerably, but the relative cost of establishment now is not greater than it was 15 years ago so far as I know, that is to say that but for this raising of pay the establishment charges would have fallen already as they are bound to do in future.

2,552. It has always seemed to me that the accounts kept by the Public Works Department are maintained in unnecessary detail. The audit office tends to insist on absolute accuracy at whatever cost where relative accuracy at a far cheaper cost would suffice. If others also hold this opinion it seems worth while to engage a special committee composed of government accountants, chartered accountants, and accountants of one or two well-known business or contracting firms to examine the present system and recommend simplifications where necessary. Detailed accounts are presumably kept because unfortunately there is a certain amount of dishonesty, as witnessed by reports in the newspapers of two Indian Executive Engineers dismissed (in Northern India and Mysore) in the last 6 months; it is the absence of moral education in ordinary Indian schools that is probably to blame, but there might be more selection for government appointments, since examination results are not the sole test of suitability for any service, more especially where there are numerous money transactions.

2,553. In existing circumstances the Public Works Department is a constructing and not a supervising department. The engineering grounding given in the Madras Engineering College is more suitable for a Local Government Board Inspector or county surveyor than for a contractor. While the present Public Works Department system obtains it is desirable to give the engineering classes more practical work than they now get, as they do all the work in India that a contractor's engineering assistants do at home.

2,554. Conversely, the subordinate classes might be given less technical education as it is not needed. A lower subordinate need only know survey and levelling and enough drawing to read a plan and set out a building. He should be trained in the small practical details he is constantly meeting, such as rope lashings for scaffolding, erecting derricks, loading and unloading heavy weights into carts or railway wagons, the use of boring tools, setting up a mortar mill, etc., and must know how to make good lime and bricks and distinguish between good and bad materials, and all the requirements of house building, road making, etc. It is quite unnecessary for him to know any hydraulics, geometry, or mensuration.

2,555. The engineer classes are at present too ignorant of the use of their hands, they should be able to get up steam, stoke and drive an ordinary portable steam engine, drive an oil engine, erect derricks, and pile drivers, work a boring plant, etc. In a special class for municipal engineers the practical work would include pipe laying, making and unmaking lead and other joints, tapping pipes under pressure, repairing bursts, fixing and reading meters, etc.

2,556. The chief defect of the men trained in the local college is exhibited in their official correspondence where they are constantly instructing their subordinates to "push on" or "take steps to show better progress," etc., etc., but no inkling is given as to how this should be done and no practical suggestions are offered.

2,557. Only a few years ago the president of the Institute of Civil Engineers in England, who is also Chief Engineer of the London County Council, was one of several employees of a firm of contractors at home. At the same time in the Northern Circars the biggest of our Madras contractors knew no more of writing than how to sign his name, and the highest paid agent of such contractor is now only a clerk or time keeper on Rs. 12 to Rs. 30 who takes his orders from the Public Works Department subordinate. The ordinary contractor in

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Southern India is usually a person with little or no general education, still less has he any technical education, so he cannot read a plan nor set out a work and the Public Works Department do this for him. He often has no capital and borrows money from a money-lender on the poor security of an accepted tender, and in such cases his profits are extremely small. He keeps no plant or machinery and the Public Works Department have to stock this and keep large stores. He seldom has business instincts; only last week I received a tender for a fairly large work in these terms "Rs. 50 below the next lowest tender;" a new contractor usually tenders below market rates and trusts to the engineers to see that he does not lose by his folly, although if they do prevent him losing they will be unfair to the more business-like tenderers. It follows that the conditions in India and at home are not comparable, and the suggestion in paragraph 9 of the despatch that the Public Works Department could be replaced by a few Local Government Board Inspectors will not be possible for many decades, three at least.

2,558. Similarly, there is much leeway in education to make up before reliable contractors, who must also be skilled engineers, are available. Paragraph 10 of the despatch appears to me to overlook the fact that engineer contractors will have to charge far higher rates to pay for their engineer staff, also that they will expect a much larger percentage of profit than is now normal. The net result of such a change is that the contractor's staff is paid instead of the engineer's, and consequently the cost of the engineer's establishment will then appear low. So far as economy is concerned there would be no benefit from the change, and in the abstract it would appear better to pay the engineer's staff which is not materially interested in increasing the profits and the consequent cost. This is not mere theorizing. In my circle a few years ago a large building contract was let to a well-known British firm at the rates then current. After one year's work they asked for an advance of rates that amounted to over 40 per cent; there was a lot of dispute and the contract was closed and work shut down. Subsequently the work was finished departmentally, and although prices had been rising during the whole period no item of work cost as much as the revised rates tendered by the company.

2,559. If contractors were to keep machinery, plant, tram-lines and trucks, then because of the comparatively few works in India requiring such plant they would have to be bigger capitalists than in England because of the much longer periods their machinery would be lying idle and obtaining no profit. This would increase the cost of work as compared with the present system.

2,560. The easiest way to start establishing private practitioners would be for government to issue notice now that after say five years hence they will undertake no work for municipalities. In the meanwhile the local engineering college should start a special class for municipal engineers so that there will be students coming on who will be able to undertake such work. If this is found satisfactory a similar notice can be issued later about district boards and other contribution works. Private practitioners must specialize if they are to get employment.

2,561. Government undertakes important municipal work all over Madras. In Madura town alone the water-works and drainage works under construction by the Public Works Department now will cost over Rs. 25 lakhs and the Director General of Stores buys the pipes and pumping plant. I believe the introduction of my above proposal will not tend to cheapen works. The Director General of Stores is such an enormous buying agency that he can obtain materials cheaper than any individual or small body like a municipality, so that even materials will cost local bodies more. Messrs. — have many branches in India but they do not sell their portable engines in this country at anything like so low a cost as we can obtain their engines through the Director General.

2,562. I believe the substitution of private for Public Works Department work will be more expensive, consequently it can only be advocated on grounds of general policy and I do not recommend it at all.

2,563. *Some defects of our present system. Land acquisition.*—(a). To acquire land takes many months; whether due to defect in the law or dilatoriness in the Revenue Department might be inquired into.

(b). The Revenue Department's estimates of land values are very faulty. Two years ago the compound of the Collector's residence at Trichinopoly was acquired. By a High Court decision 3 months ago over Rs. 4,000 more has been paid the late proprietor besides legal expenses. About the same time a plot of land for a *dharamsala* was acquired by mistake in Rameswaram and the price paid was over Rs. 1,000; when attempts were made to sell it about a year ago no one would offer one quarter of the purchase price.

(c). The method of notification is wrong. If land for a new irrigation canal is notified and some years later the land for distributaries is notified the price of land is found to have risen by reason of publication of the first notice. All land under a project should be declared at one time even if not occupied for several years, because the price to be paid depends on date of notification and not date of acquisition. This method will cheapen land a little.

2,564. *Inconvenience of present official year.*—Many foundations and most irrigation works must be carried out in the dry season, and it is therefore our busiest construction time. The lightest construction time is from September to November when most labour is in the fields during the busiest part of the agricultural season. During our busy construction time all subordinates and many officers should be out on inspection and supervision duties, but the end of the financial year makes their presence in their respective headquarters imperative when they are most wanted on works. If the financial year of the Public Works Department stopped in September or October there would be least interference with our works while the staff are adjusting their payments to suit the annual grants.

2,565. *Late issue of budget (a).*—The ordinary public on hearing of the sanction of a work expects to see it start at once. They forget that funds have to be arranged, contract drawings and specification drawn out, tenders advertised for and compared after submission, and an agreement obtained from the successful bidder. The contractor has then to build sheds for perishable materials and watchers before he collects his labour and materials. Work can now start, but no payment is possible till a month later when a bill has been made out for work done. The Indian contractor being no hustler the first payment is not likely to be due till, at least 4 months after tenders were advertised for.

(b). The wet season is the time when tenders should be called for so that work may be in full swing all the dry season. If the period of our financial year were altered the delay at such a season would not be of so much consequence. If the financial year cannot be altered it would be very advisable to have a special preliminary issue of the budget for new works early in October. The preliminary issue is now made early in February and reaches Executive Engineers late in February, the final issue usually comes out in May. The budget is sent to Executive Engineers through the Superintending Engineer and it would save a few days if they are posted direct to Executive Engineers from Madras. Anything we can devise for speeding up work means a saving of interest on capital and should be recommended.

2,566. *Advances not payable to contractors.*—The only two advances sanctioned by government with which I have been connected were both to firms who could well have afforded to do without, but their tenders included these terms. For the pumping plant at Divi, I had to pay Messrs. — about Rs. 1½ lakhs before their machinery arrived at site or had been seen by any Public Works Department staff. For a big road bridge on the Trichinopoly-Coimbatore boundary now under construction Messrs. — have been paid large

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advances on the certificate of their managing director that it had been put on rail at Calcutta.

A contractor constructing a large teak-roofed building gets all his wood for doors, windows, and roof simultaneously, but he may not get paid for the wood in the roof for a year or more after his outlay. The rule is unnecessarily severe.

In the ophthalmic hospital in Madras a few years ago, while closing a contractor's accounts and checking materials for taking over, a dealer came to the work and started removing materials on the ground that the contractor had never paid him for them. If government solicitors can find a way out of such difficulties in such a manner as to safeguard government against loss the restriction could be removed to the great benefit of our contractors and their work.

2,567. *Powers of Executive Engineers too low.*—I have already suggested that the Executive Engineer's accounts are probably unnecessarily elaborate and might perhaps be capable of simplification. Each Executive Engineer spends from one to five lakhs of rupees a year and has powers of sanctioning estimates up to some hundreds of rupees. Yet he cannot authorize the sale of a temporary thatched shed that he puts up on a work for storing materials and that is probably not worth more than a few rupees at the time work closes (see Code, paragraph 908). Also he cannot write off the accounts the broken measuring glass of a rain-gauge (see Code, paragraph 1219). In these and probably other matters his powers may be enlarged with advantage to business.

MR. C. T. MULLINGS called and examined.

2,569. (*President.*) The witness stated that he was in the permanent employ of the Public Works Department, that he was officiating as a Superintending Engineer and that he had been trained at Cooper's Hill.

2,570. The system followed in the Madras Public Works Department in inviting tenders was to post up figures showing the quantities of work to be done on notice boards in the offices of Executive Engineers and to leave it to contractors to furnish their own quotations. The question whether tenders were invited for a whole work or for separate portions of it depended entirely on the magnitude of the work and the Public Works Department occasionally supplied the materials irrespective of the course adopted. Tenders were invited for piece-work as well as regular contracts, but the former system was more in favour as it facilitated getting rid of inefficient contractors. It was not so much that contractors were not allowed to tender for an entire project, but that the class who usually tendered were not financially capable of undertaking it. In the circumstances, tenders for entire projects were seldom received. Apart from this contractors specialized more or less in particular sub-heads of work, e.g., brickwork and wood-work, thus making it all the more difficult for them to take up a whole scheme. The lowest rates tendered for each sub-head of work were usually accepted.

2,571. The government and local board rates were approximately on a par, and contractors in the Madras presidency generally tendered for local board works at the rates shown in the Public Works Department schedule, which was revised each year and prepared more or less with reference to the rates at which work had been executed during the previous year. Each division had its schedule of rates embracing the rates for all localities in its jurisdiction but a separate schedule was not prepared for each sub-division, irrespective of its situation. Rates differed in the several sub-divisions, and occasionally also in different portions of the same sub-division, and he expressed himself as unable to agree with the contention put forward in evidence that between a quarter to one-third of the rates shown in the schedule were unreliable, as he considered that the schedule was compiled as accurately as was possible.

2,572. He considered that the Public Works Department was not a more expensive agency than a local body as their respective rates were practically similar. He thought the cost of establishment in the Public Works

2,568. *Recruitment of engineers.*—With the growing rates for labour the prospect of the far greater use of mechanical means draws nearer. If one or two of our big projects are sanctioned a tremendous quantity of mechanism will be used because as many labourers as required could not be got into the confined space in which we must work. There is not much opportunity for persons trained in this country to get an insight into the management of large works of great diversity, and the training in foresight connected with the layout and in resourcefulness and responsibility is therefore lacking in the Indian-trained engineer.

The man from home with the A.M.I.C.E. qualification, *ipso facto* according to the present rules of the Institute, has had an apprenticeship besides his college course, and is therefore better equipped for the Public Works Department and should draw higher pay and pension.

It is, however, desirable that the India Office should specify the kind of apprenticeship that will be considered the best for their appointees. In the Hyderabad State is an officer in the Irrigation Department who was apprenticed to an engineer who specialized in metallurgy; we want to avoid that sort of thing. Other trades like ship-building, railway, and harbour engineering might perhaps equally be excluded for our use, but specializing in water or drainage works or hydraulic or road engineering should be encouraged.

Architects, like poets, are born not made and should always be nominated to the Department.

Department was about 25 per cent. but on being informed that it was 27 per cent. he remarked that this latter figure might be correct. He did not know what the percentage was in the case of district boards, but mentioned that the Public Works Department did a lot of work for local boards. He was then informed that the percentage in the case of district boards varied from 10 to 14 per cent. and explained that by his statement that the two rates were practically on a par he meant to convey the idea that both agencies were doing identically the same work for the same price. He admitted, however, that if establishment charges were taken into consideration there would be a difference in favour of the district boards.

2,573. One of the reasons in his opinion for the high establishment charges in the Public Works Department, as compared with those of district boards was that the former agency was entrusted with all the isolated and least accessible smaller irrigation tanks which were scattered all over the presidency. It was true that most of the minor irrigation works were maintained by Collectors of districts; but in the Periyar system of irrigation the Public Works Department had charge of all the tanks, irrespective of their size, because they maintained the main canals which fed these particular tanks. He added that only the smaller tanks, *viz.*, those which irrigated an area of less than 200 acres had been made over to the Collector, and considered that under the present arrangement the two agencies had satisfactorily executed work in the past. He had no recommendations to make on the subject of the Public Works Department establishment charges, and he did not consider these charges were excessive in view of the labour involved in the preparation of estimates which sometimes cost considerably more than the actual work itself. He admitted that if the smaller Public Works Department works were handed over to the Collector for maintenance the charges for departmental establishment might be reduced, but was doubtful whether the Collector would in such a case be able to have the work satisfactorily done, as even the small irrigation tanks that were at present under his control were maintained in a bad condition, in that the bunds of several of them were too low and the weirs short. Further, though these small tanks served their purpose fairly well, they were liable to breach, and when this occurred the large tanks under the Public Works Department were also breached on account of

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the sudden inrush of water which it was not possible to allow for. He thought, in fact, that owing to the inefficient maintenance of minor irrigation works by Collectors the Public Works Department were obliged to incur additional expenditure on the tanks under their charge.

2,574. With reference to the statement in his written evidence that "even to inspect (a very unimportant small irrigation work), take levels and prepare an estimate may cost in the occupied time of the subordinate, his survey lascars and his sub-divisional officer (*i. e.*, in pay and travelling allowance) an amount equal to the estimate when framed," he explained that such cases did occur occasionally and remarked that what he had stated was a fact and not a supposition. For instance, if there were a number of small pipes in a channel, a man had to take the level of the fields, and ascertain the area, and though a subordinate might be competent to do this, it was necessary for the sub-divisional officer to go round and see that the work was satisfactorily done to obviate certain persons being served from two sources instead of one.

2,575. An additional reason for the high cost of the Public Works Department establishment was that the work done free of charge by government for local bodies increased the percentage, but, except in respect to his own circle, he could not say how much work government actually did free of charge for local bodies. He was not able, however, to furnish figures showing the cost of establishment in his own circle, but mentioned that the Public Works Department were at present engaged in the investigation of two district board railways in his circle to ascertain whether there were a sufficient number of waterways, and this work entailed a considerable amount of time owing to their being a great deal of *zemindari* land to survey. The particular railway concerned in this instance was the South Indian. Its engineers had prepared the estimates for the district board and the Public Works Department were required to satisfy themselves that a sufficient number of waterways bridges, level-crossings, etc., had been provided. He thought the estimates had been submitted by the district board to government who had passed them on to the Public Works Department, and this procedure really connoted that the survey of a competent railway engineer was submitted to a local investigation by a Public Works Department engineer, but it was necessary as railway engineers were not conversant with irrigation waterways, etc. Though he admitted that the amount of actual construction work done free of charge by government for local bodies was exceedingly small, he was not able to say without seeing the figures whether such amount effected, even by a decimal point, the Public Works Department percentage charges but he added that he thought the establishment charges were increased on this account.

2,576. The technical scrutiny of plans and estimates in excess of Rs. 2,500 was also done free of charge for district boards by the Superintending Engineer. In his opinion a Superintending Engineer devoted about one-eighth of his time to such work, and other work, *e.g.*, mission buildings, schools, etc., and before he could approve these estimates every detail in the plans and estimates had to be scrutinized very carefully owing to the incompetency of the district board engineers. For the latter reason, and as the results of the Superintending Engineer's scrutiny revealed numerous errors and necessitated the revision of estimates, he considered the prior submission of these estimates to the Superintending Engineer for professional approval very necessary, and added that very often district boards did not secure an engineer who was competent to prepare plans and estimates for buildings costing more than Rs. 2,500, even on a salary of Rs. 1,000 per mensem.

* Mr. Mullings afterwards wrote that Rs. 9 lakhs of estimates had been checked in his circle during the calendar year 1916 for municipalities, local funds, missions, courts of ward, minor irrigation (Revenue Department), besides ordinary Public Works Department work, and that this was rather larger than usual.

2,577. The building he had referred to in his written statement, for which a contract was given to a British firm, which, however, gave up the work after partial construction, was the Madura district *katcheri*, and as that contract was given out six years previously, the work was not then in his charge though he had completed it departmentally last December. This case was first submitted to arbitration, but as the contractor was not satisfied with the award it led to litigation. The High Court's first decision was in favour of the Public Works Department and an appeal by the contractor resulted in the latter obtaining a decree in his favour. A further appeal had, however, since been made by government to the Privy Council, the result of which was awaited. The reason for the dispute was that the contractor desired the rates increased by 40 per cent. at an advanced stage of the work. Construction was completed departmentally after an interval of two years, during which the rates had risen with the result that some of them amounted to about 30 per cent. more than the original rates. No item of the work, however, cost as much as the contractor's revised rates. His personal opinion was that the demand of the contractor for an additional 40 per cent. was unreasonable, as after the lapse of six years, *i. e.*, from the date of sanction to the original estimate to the date the Department completed the work, the schedule of rates for work in the locality had only increased by about 12½ per cent.

2,578. For the encouragement of private enterprise he proposed that government should announce that in five years' time municipal works could be undertaken by suitable private agencies, and that the Municipal Act should be amended so as to provide for their works being given to qualified engineers only. It was pointed out to him here that the amount of municipal work in the presidency was small, but he did not agree that this was so as the Public Works Department were at present constructing a work worth Rs. 25,00,000 for the municipality in Madura. He admitted, however, that as this work related to large water-supply and drainage works it might be regarded as an exceptional case. He was then informed that the Sanitary Engineer had expressed the opinion in evidence that sanitary works were better executed by large contracting firms than by the executive staff of the Public Works Department. To this he replied that his suggestion also referred to the general buildings and roads work of municipalities. Further, that as municipal works were small and easily supervised, and as it was possible that municipal commissioners and other people attached to the municipality might help by inspecting them, a start might be made with municipal works rather than government works. He added that the professional supervision that would then be necessary could be provided for in the Municipal Act by allowing for a municipal engineer for each municipality.

2,579. The preliminary edition of the budget was usually received about the middle of February, and though he was authorized to start works in anticipation of grants for them being allotted, such works were stopped if no provision was made for them in the final budget. He considered the middle of February much too late a date for the proper regulation of work, and that the commencement of the financial year ought to be so fixed that the budget could be forwarded to Superintending Engineers in October, which was the period of the year when it was most difficult to secure labour owing to the harvest being in full swing. All arrangements to commence work could then be settled by about the middle of February, the beginning of the working season, which lasted up to June, the time for ploughing.

2,580. He stated that payments could only be made to contractors for the supply of materials on completion of work. He was then informed that an accounts officer had stated that such payments could be, and were actually, made and replied that this particular officer always objected to such a practice and held that it was an advance prohibited by Code rules. He also did not agree with this officer's statement that there was no need to grant advances. His experience had been that the

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Public Works Department did not pay for materials unless the contractor happened to be a piece-worker.

2,581. In his opinion, the chief reason for the high rate of 27 per cent. in the establishment charges in Madras was the existence of scattered irrigation works, whereas the low expenditure of an Executive Engineer in Madras, as compared with that of a similar officer in any other province in India, was due to the larger area the former had to control and also to the inadequate rates prevalent in the presidency as compared with those of other presidencies.

2,582. He did not know why there were on an average as many as eleven upper subordinates in each division in Madras, as compared with three or four in the divisions of other provinces, but thought that this also might be due to the larger area contained in each of the Madras divisions.

2,583. (*Sir Noel Kershaw.*) With reference to his statement regarding the revision of estimates by the Superintending Engineer, he cited a case of a mistake made by a district engineer, who was a B.A., and B.E., in designing a road bridge worth about Rs. 1,00,000 but admitted that the number of bridges worth that sum, under a district board, was very small. It was not the case, however, that only about one such bridge was erected in an interval of 10 years, as the Public Works Department had about three in the previous year in his own circle worth about Rs. 94,000 each, and he thought the average was about one a year in a circle which in the Madras Presidency comprised from four to five districts. The mistakes he had referred to were not due to ignorance of engineering but rather to carelessness.

2,584. He agreed that the bulk of the estimates received from district boards did not refer to works worth about Rs. 1,00,000, but rather to small works costing between Rs. 2,500 and Rs. 5,000. He added that as the majority of these did not exceed Rs. 2,500, they were not submitted to the Superintending Engineer. With reference to the estimates for district board schools he explained that primary schools usually cost less than five thousand rupees whereas high schools were much more expensive. The former class of estimates therefore were not as a rule, submitted to him for approval. In respect to high schools he had during the previous month received an estimate for one costing about Rs. 60,000.

2,585. He adhered to the statement in his written evidence that "a contractor constructing a large teak-roofed building gets all his wood for doors, windows and roofs simultaneously, but he may not get paid for the wood in the roof for a year or more after his outlay," but did not agree that the same might be applied to the Public Works Department as he considered the latter were a much larger buying agency and more likely to buy teak when they required it. He admitted, however, that as it took some time to manufacture doors and windows such items would have to be seen to in advance and that by this procedure either the Public Works Department or the contractor might be put out of pocket for a limited period. The latter, however, would be at a greater disadvantage as owing to contractors in Madras not allowing for interest in their tenders he was likely to lose his profit.

2,586. In respect to the statement in his written evidence that "it was desirable that the India Office should specify the kind of apprenticeship that will be considered the best for their appointee. In the Hyderabad State is an officer in the Irrigation Department who was apprenticed to an engineer who specialized in metallurgy; we want to avoid that sort of thing. Other trades like ship-building, railway, and harbour engineering might perhaps equally be excluded for our use" he admitted that a training as a railway engineer was beneficial, but considered that such a training was unsuitable for irrigation officers in the Madras Presidency where the major portion of the work was irrigation.

2,587. (*Mr. Mackenzie.*) A railway-affected tank was one that was liable to damage a railway if it breached, and such a tank was often one in a chain of numerous other tanks sometimes amounting to as many as a hun-

dred. All the tanks in the chain had certain data attached to them showing the catchment areas, the weirs, sluices, etc., in addition to the bunds, and the details were in the possession of the Public Works Department. Hence the designs of railway engineers had to be checked by the engineers of the Public Works Department.

2,588. (*Mr. Cobb.*) Though he thought that the Public Works Department found it easier to work with petty contractors than with a single contractor who had undertaken an entire work, he did not think that of these two classes of contractors the petty contractor was always preferred and remarked that he personally preferred, and would readily accept, the services of a single contractor who tendered for an entire project provided it was a large one. He added that though the employment of a single contractor on the Madura district *katcheri* building had proved a failure, he was at present endeavouring to secure the services of a single contractor for the construction of a district court which was estimated to cost Rs. 1,75,000.

2,589. Only a schedule of quantities was furnished when notices of works were put up in Public Works Department offices as the schedule of rates was not a public document, but he admitted that the rates were probably known to contractors though they were not included in the notices. Contractors never actually tendered at rates given in the schedule of rates, but simply made a statement to the effect that they would undertake work at a certain percentage above or below those rates. As he believed the Public Works Department were capable of executing work on their schedule of rates, he did not agree that it was unfair to contractors that they should be obliged to carry out work at the same rates.

2,590. He was not certain whether the expenditure on all tools was charged to the work under the main head of the estimate, viz., "Tools, plant and machinery" in the case of a large work. He was then informed that it had been put forward in evidence that tools were not charged to the work, but only large plant, and he agreed that if this was the case it would be rather hard on a contractor who wished to tender for a particular work because the schedule rate would not include items of considerable importance as a set-off against such expenditure. Ordinarily, estimates for works costing up to Rs. 20,000 did not allow anything for tools and plant. (*Mr. Howley* here stated that he thought that tools required in the course of execution of a particular work were frequently purchased and charged to the work and that, in all divisions, accounts were always kept of the expenditure on tools charged to works.) The witness thereupon remarked that tools were not always provided by the Stores Division on payment of their hire charges paid by the Public Works Department. In all other cases a separate tools account was maintained. He was not aware that there was as much as Rs. 40,00,000 worth of tools and plant in the Stores Division, and was unable to furnish an explanation as to why it was considered necessary to maintain so large a reserve stock.

2,591. Though he admitted the extent of irrigation works under Collectors might be on the ascendant he did not think their actual number had also increased.

2,592. From his experience of district boards and municipalities he preferred the latter to the former as they were more business-like, and thought that of the two a municipality was the better agency for the execution of works owing to its smaller area, as compared with that of a district board which occasionally amounted to as much as seven or eight thousand square miles. In the circumstances, he did not favour the handing over of additional work to district boards.

2,593. The actual construction of a work could not be commenced on receipt of the preliminary budget, but tenders could be invited and a contractor selected and requested to proceed with the collection of material. It was not permissible, however, to spend a large sum of money until the receipt of the final budget, and if the grant for a work was not allotted a small grant was made for the payment of such preliminary outlay as had been incurred prior to the receipt of the final budget.

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2,594. (*Mr. Mackenzie.*) In fixing a specific rate for entry in the schedule of rates allowance was made for the contractor's profit, but no provision was made for expenditure on tools.

2,595. (*Mr. Howley.*) In the case of a building worth about Rs. 30,000 or Rs. 40,000 the value of the tools used for which no rent was paid to the Stores Division would be less than Rs. 300, and this was approximately the amount which had been debited on this account to the estimate for the Madura district *katcheri*. The item was usually a small one as many of the piece-workers used their own tools.

2,596. The schedule of rates specified only initial rates for a particular district, or part of a district, and did not indicate the rates at which a particular work had been carried out.

2,597. It was true that, owing to a rise in rates during the past five years, the Public Works Department were obliged, on the decision of an arbitrator, to take over the large quantity of materials collected by the

contractor who started the Madura district *katcheri*, at a much higher rate than they might have purchased them from petty contractors.

2,598. When materials were brought to the site of work by a contractor and a payment was made he thought the Accountant-General invariably challenged it on the ground that the agreement was for finished work only. (*Mr. Howley* remarked that though this was not what the Deputy Accountant-General had put forward in evidence it was a fact.)

2,599. He agreed that there was usually very little time to start a work in many Madras divisions as it was only possible to manufacture bricks economically in January, February and March owing to the periods of the two monsoons.

2,600. There was no delay in the construction of works in progress even if the budget was received late as expenditure on such works was invariably allowed for in framing the budget.

W. H. JAMES, Esq., M. Sc., M.I.M.E., A.M.I.C.E., Principal, College of Engineering, Madras.

Written Statement.

2,601. The points raised in the resolution bearing in particular on the educational aspect of the question appear to be the following:—

(a). Whether the system of education in government engineering colleges is organized on a sufficiently broad basis to meet the demands of private agency as well as of government.

(b). Whether the colleges attract suitable candidates.

(c). Whether the standard of instruction is sufficiently advanced to provide fully qualified civil engineers for employment by government, local bodies, and private engineering and contracting firms.

(d). Whether adequate provision is made for the practical training on works of students who have received their scientific education in English or Indian colleges.

These are taken *seriatim*, the remarks having reference more especially to the conditions prevailing in Southern India.

2,602. (a). The suggestion that the system of education in government colleges is not organized on a sufficiently broad basis has reference possibly to the existing regulations governing admission to and prosecution of courses of study being considered somewhat rigid and that it might be advisable to provide more alternatives in the way of courses of study and to make the rules of admission to the higher courses more elastic.

(2). The policy of government up to the present has presumably been influenced by the needs of the country and the ruling factor has been the provision of qualified men for the public service, and whatever changes may be introduced it is questionable whether the time is ripe for the removal of most of the present restrictions. With circumstances as they are, a fairly high standard of general education is very essential as a condition precedent to admission, and much freedom in connection with the courses of study that may be pursued is hardly possible when a college diploma is regarded as a guarantee that the holder can be relied on to perform the varied duties that often fall to the lot of the young engineer in India.

(3). In other and technically more advanced countries it is virtually possible for any youth who desires, provided he possesses the necessary preliminary qualifications and can afford it, to enter on a course of engineering study, and he sometimes has certain freedom in choice of subjects, but he realises his sole responsibility in the matter and does not consider that the possession of a diploma places him in the position of having exclusive or even prior claim on any class of appointment, but only that it may help him in obtaining a very moderate start.

(4). The very different conditions in some ways that obtain in this country it is hardly necessary to dwell on and presumably the reason for government placing a limit on the number of admissions to the engineer class has been the knowledge that appointments are not avail-

able in public or private service for large numbers of men with comparatively high technical qualifications.

(5). In regard to the organization of courses of study in civil engineering, it may be said that, in general, either of two systems may be adopted; in the one, the idea is to provide a fairly thorough general training extending over the whole period of the ordinary course, with specialization following later, and in the other, an attempt is made within the ordinary period to give a specialized training based on what must necessarily be a narrower foundation of general knowledge.

(6). The first method is followed here and our existing courses are intended to give, so far as the time will allow, an efficient grounding in the elements of engineering science, and while no attempt is made at early specialization all the more important branches are touched upon to a greater or less extent. Very few of our students have any definite ideas as to what they are going to do after completing the college course, but with a sound preliminary training there should be no difficulty whatever in working up the knowledge required for any specialized branch of engineering. It cannot be emphasized too strongly that, except to a limited extent, it is only general principles and not practical engineering that can be taught in a college, and in any case the student going out into the world now-a-days finds that all branches of engineering tend to become more and more specialized and that if he wishes to make headway in his selected line he must rely on his own efforts to a very great extent.

(7). A college, however, when working on the lines indicated could be of considerable assistance in connection with specialization by providing, from time to time if there is sufficient demand, courses of instruction in special branches quite apart from but possibly to some extent in continuation of the ordinary college work. It might also help in some directions if persons not desirous of taking the diploma but specially interested in particular subjects were allowed to attend such special lectures and demonstrations, but this should be subject to the condition that they would not be given any hall-mark of qualification by granting them a certificate except for attendance. Proposals on this basis have been submitted to the Government of Madras, but I gather the matter is being held over until we move to our new premises and have ample accommodation for such purposes.

(8). The second system necessitates the provision of such special courses as it may be considered are called for with a corresponding increase in the number of classes and staff, and unless these classes are well filled all this connotes waste of energy which the end in view may not justify, quite apart from what is considered by some the questionable policy of encouraging students to pursue somewhat inadequate courses.

(9). The precise system however which in the long run it will be found expedient to adopt will naturally depend

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on the particular local conditions and the prospects of employment for passed students. In technically advanced countries the students joining colleges have usually a better instinctive knowledge of engineering and are accordingly more fit for early specialization, and also openings for such men are far more numerous than in relatively more backward countries. India can only be regarded just now as coming under the latter category and what is wanted in Southern India at any rate is not the institution of many specialized courses or much modification of existing regulations, but more opportunities for the men turned out of the college at present. During the last ten years, engineer diplomas have been granted to 158 students and of these about 40 per cent. have obtained what may be considered as engineer appointments in the Public Works Departments of Madras and the native states and under the local fund and district boards, and the remaining 60 per cent. have had little choice but to accept upper subordinate appointments in the Madras Public Works Department.

2,603. (b). The reply to this query will depend on the interpretation to be placed on the word "suitable."

(2). Candidates may be considered with reference either to the position of the parents or guardians or in respect to the adaptability of the youths themselves for engineering work.

(3). During the last ten years, 245 students have been admitted by selection based almost wholly on the results of the University examinations, and the following are the approximate percentages relative to the financial status and occupation of the father or guardian, and the communities to which they belong :

According to—

Wealth—

Richer classes	5 per cent.
Middle "	92 "
Poor "	3 "

Occupation—

Officials	62 "
Landholders	34 "
Traders, etc.	4 "

Class of community :

Hindus :—Brahmins	79 "
Hindus—Non-Brahmins	10 "
Indian Christians	8 "
Europeans and Anglo-Indians	2 "
Muhammadans	1 "

Our engineer class is shown by the foregoing to be mainly drawn from the Brahmin community, who constitute the larger part of the official and landholder class in Southern India. The particular genius of this community in the past has not been of the type embracing manual dexterity of the kind called for in engineering, but although some students are clumsy and obviously lacking in mechanical instinct, it cannot be said on the whole that Brahmins compare unfavourably in this respect with other classes, and it is not evident from what other communities more suitable candidates can to any extent be drawn.

(4). Intellectually our students are at least on a par with those entering ordinary government employ or proceeding with their studies in other directions, but the prospects of our passed students are circumscribed, and until the time comes when engineering as a career can offer prizes comparable to those that are to be gained in the practice of law and general administration work, it must be the case that many of the best and most promising students of the University will aim at joining the legal profession. The very limited opportunity of advancement and remunerative employment must have deterred many an able and ambitious youth from taking up engineering, and the gradual throwing open of further avenues of employment would undoubtedly raise the status of the engineering profession in this country and help to attract the very best class of men to engineering work.

2,604. (c). The standard of instruction in engineering that obtains in this college is sufficiently advanced

for all that is ordinarily demanded of civil engineers, whether in government or private employ, as will be evident from a perusal of the syllabuses of the course of instruction and the examination papers.

(2). Architectural work is not usually regarded as coming within the scope of the engineer and no provision is made here for teaching in that branch of knowledge, but it undoubtedly is the case that the design of buildings has often to be undertaken by the more technical professional man in this country, and instruction in architecture could be made a branch of college work if it is considered desirable.

(3). It will be observed from the calendar that the course extends over five years—four in college followed by one year's practical training on works. The syllabuses cover much the same ground as in technical colleges of the front rank in Great Britain and it can safely be asserted that the theoretical treatment of the various subjects is quite as extended. Just now our courses of instruction are not quite as efficient as they might be for want of full laboratory accommodation and equipment, but this fact was fully appreciated by the Government of Madras some years back when it was decided that the college should be moved from its present somewhat confined situation to a site extending over about 200 acres at Guindy just outside the southern boundary of Madras city, where it will also be fully residential. Construction work was started in 1913 and it is expected that the buildings will be ready for occupation in about two years' time. The sanctioned estimate amounts to about Rs. 17½ lakhs and adequate provision is being made in the way of buildings and equipment for teaching purposes in the three main branches of engineering—civil, mechanical and electrical. For civil engineering in particular two separate laboratories are being erected for investigatory and demonstration work relating to the strength of materials and hydraulic engineering respectively. The strength of materials laboratory will afford accommodation for the machines we have at present and the others that are necessary to form a complete equipment for the testing of materials of construction, including mortars, cements and reinforced work, and the hydraulic laboratory will have all that is required for work bearing on the flow of water along pipes and channels, through valves, orifices, and notches, and also a complete installation of standard types of pumps and turbines suitably arranged with overhead and underground tanks for carrying out tests under conditions approximating to those met with in practice. In connection with this laboratory also the scheme embraces proposals for the construction of small out-door works relating especially to irrigation and sanitary engineering, such as gauging tanks, channel drops, sluices, pipe lines, etc., which cannot conveniently be accommodated in buildings.

(4). Our course in surveying, the other main general subject of civil engineering, is at present sufficiently thorough for ordinary requirements and with our very complete stock of surveying instruments—comprising 64 theodolites, 86 levels, with compasses, plane-tables, etc. in proportion—we are able to give our students ample opportunities for field manipulation in term-time and particularly during the special annual period of about four weeks devoted wholly to survey camp and project practice.

(5). With all the buildings completed and the equipment already sanctioned in working order, the courses will be quite up-to-date and should bear comparison with those of any first rank technical college. Full and detailed information regarding the new college and the courses of instruction will be placed before the Committee.

2,605. (d). Satisfactory provision is made in connection with this college for the practical training of students. It has been stated that the last year of the five years' course is spent by the students on works, the intention being to give them some opportunity of becoming familiar with the actual conditions of practice and of gaining knowledge and information as to the methods of carrying out work. Civil engineer students are posted according to their desire either to executive divisions in the Public Works Department or to the Madras Corporation water

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and drainage works. In the latter a fee of Rs. 200 has to be paid, half of which is refunded by Government if the student makes satisfactory progress. All students are given subsistence allowances and travelling allowances for joining and for journeys made in connection with their training. Reports are made periodically to the Chief Engineer, Public Works Department, and to the Principal of the college regarding the work on which they are engaged and their progress, and if the latter is not satisfactory the diploma of the student is withheld pending receipt of a sufficiently favourable verdict on his efforts during an extension which he has to take without allowances. The system of practical training in continuation of the theoretical course has been in existence in connection with the college for both engineer and upper subordinate students for about 30 years and is a very valuable feature of our courses. Apart from other obvious advantages it gives the student a chance of realising how he stands in relation to practical work, which is an important consideration in this country

where circumstances sometimes demand that a student directly on completing his training shall take over responsible practical duties.

(2). With a view to improving their efficiency for district work, during this period the students attend during the morning hours for about six weeks the equitation school of His Excellency the Governor's Bodyguard for a course of instruction in riding.

(3). In the matter of the practical training of students who have received their education abroad the recommendation has recently been made to the Government of Madras that such students belonging to this presidency should be treated on all fours with our own college students.

(4). It is perhaps well to emphasize that there is no suggestion that with this one year's training the young engineer is to be regarded as fully qualified for practical work, and it would be of advantage if the necessity for a sort of probationary period, tacitly accepted in one form or another elsewhere, could be recognized in this country.

MR. W. H. JAMES called and examined.

2,606. (President.) The witness stated that he was the Principal of the Madras Engineering College and that he had held that appointment for about ten years. He was not recruited direct from England for this post but had joined the college as professor of engineering in 1901.

2,607. Students were admitted into the college in two classes, one the so-called engineer class and the other the probationary subordinate class. The course for the engineer class extended over four years and was followed by a year on works. For the first two years the courses were common to all engineering students but thereafter they bifurcated and the students elected at that point whether they would take civil or mechanical engineering in the special courses which formed the last two years of the training. The course for the probationary subordinate class lasted two years, and 90 students were generally admitted. 30 of these students were selected for promotion to the upper subordinate class where they took a further two years' course followed by a year on works. The remaining 60 took only one year's further course without any practical training and therewith qualified as lower subordinates. The period of training both for engineers and upper subordinates was five years, four years' theoretical followed by a year's practical training.

2,608. Under the rules the selection of students for admission rested with the principal. The educational qualification required for the engineer class was the intermediate examination of the Madras University in group I which covered mathematics, physics, chemistry and English. For the probationary class the educational standard laid down was the matriculation or the school final certificate. There was no minimum age limit but the maximum was 20 years for both classes. The principal had a certain amount of discretion as to the number of students to be admitted to each class but the applications for admission were always in excess of the numbers that were admitted, for instance last year the number of applicants for admission to the engineer class was 168 out of whom only 30 were admitted.

2,609. The reason why there was a great demand for admission into the engineering college was that a man who could get a certificate was more or less settled for life. He admitted that there was only one guaranteed appointment for engineers but pointed out that the others could secure local fund appointments and even if they could not get engineer appointments were at least sure of getting employment as upper subordinates in the Public Works Department where they had better chances of promotion than the ordinary upper subordinates. No student had ever told the witness that he joined with the object of settling as an architect or as a contractor and their sole object was to seek government, native state, municipal or district board service.

2,610. The present age-limit for admission to the college was quite satisfactory. The principal had

absolute freedom in that respect and was not tied down by any rules. He had sometimes admitted students at the age of 16 or 17 years. Last year the average age of students admitted to the engineer class was 18 years, 9 months, 6 days, the year before it was 18 years, 10 months, 6 days, the year before that it was 19 years, 2 months and in the year preceding that it was 18 years, 9 months while the average age for admission to the probationary class was 18 years, 9 months and 10 days though the minimum educational qualifications for students joining that class were less than those for students joining the engineer class. This was due to the fact that the best men joined the engineer class. If a man had obtained a school final certificate at 16 years of age he went in for the University course and then joined the engineer class. If however, he could not get the school final certificate till he was 18 it was too late for him to take a two years' course in the University and he therefore joined the probationary class. In certain cases the witness had made an exception and admitted students who were over age on account of special circumstances. The majority of the students could not get their school final certificates before they were 18 years of age, but the witness could not state definitely the average age at which they passed that examination. He admitted that the main justification which could be urged for admitting students at a higher age was that students at a lower age were not available, and that it was possible that if some of the elder men had not applied for admission, younger men would have been selected. He did not think there was any great need to get men for the probationary class at a younger age. As matters stood these men even at 18 were not at all too highly qualified for the requirements of that class. He did not support the suggestion that the maximum age for admission to the engineering college should be fixed at 17 because he could not get good candidates at that age and if it had to be lowered preferred fixing it at 18.

2,611. He was not in favour of the proposal that the educational standard for admission into the engineer and probationary classes should be lowered and a longer course, including a certain amount of general education, given in the engineering colleges, considering it preferable that general education should be given in the Arts colleges rather than in a technical college. As far as the curriculum was concerned he did not think there was anything wrong in group I of the Madras University intermediate course from the point of view of students joining the engineering college nor did he think it was susceptible of much improvement in any way. He pointed out, however, that the success of the course depended entirely on the teaching staff.

2,612. The courses for civil and mechanical engineering students bifurcated after two years, and this he considered was a very good arrangement, the bifurcation taking place at the right stage. He was not in favour of bifurcation at any earlier or later stage as the

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course during the first two years was a general one and it was he thought proper that a civil engineer should know a little of machine drawing, etc., and the mechanical engineer should know a little of building drawing.

2,613. The course for mechanical engineers was introduced in 1908 and this year 14 students had been admitted into the class. The average number of students joining the class since 1908 had generally been between 4 and 6, the small numbers being due to the fact that it was only last year that the college had obtained a good electrical engineering laboratory. He did not agree that there was no demand for mechanical engineers in Madras and was of opinion that the small numbers joining were entirely due to the fact stated above. He was of opinion that mechanical engineering was the fundamental basis of all engineering and that the ideal thing would be to make all civil engineers take a course in mechanical engineering. The mere fact that a man who took up mechanical engineering afterwards accepted appointment as an upper subordinate did not affect the question of the importance of mechanical engineering. The knowledge these men had acquired gave them better chances of becoming good civil engineers, and he had gathered from the Public Works Department authorities that they were prepared to take such men and had not the least objection to their training. The one appointment annually guaranteed was open both to civil and mechanical engineers and that he considered to be the proper system, as he did not think that one class of engineers should be penalised for the sake of another. He did not think that the selection of a mechanical engineer in place of a civil engineer was in any way detrimental to the interests of government, as apart from the value of the training there was always a certain amount of mechanical work which such a man could perform very efficiently. He did not think that the mere fact of a man being a mechanical engineer was any drawback. The men who went through the course of mechanical engineering were also eligible for appointments as upper subordinates in the Public Works Department, but he admitted that civil engineers would probably be selected in preference to mechanical engineers for local bodies and municipalities and that a mechanical engineer could only hope to get employment with such bodies in connection with mechanical work. Mechanical engineers were much handicapped owing to the dearth of industries but the witness hoped that with the steady development of industries in the future there would be openings for them and that students would take up that line.

2,614. There had been a technical class for *mistris* in the Madras college some 18 years ago, before the witness joined, but it had been abolished and he could not give any information about it. He believed there was a day class in Vepery which provided instruction for *mistris* but did not know of any night class for that purpose in Madras.

2,615. In regard to the theoretical standard in the Madras college he stated that the course extended over 4 years instead of three years only as at Roorkee and Poona, which enabled the students to carry on their studies a little further. Judging by the syllabus of studies he thought that the theoretical training in all the colleges was practically the same. As compared with colleges at home he thought the syllabus was quite as high as that of an ordinary English engineering college.

2,616. He did not agree with the criticism that the theoretical training imparted to the subordinates was too high for the class of work they were required to do. It was a little high no doubt, but the college aimed at turning out men qualified to undertake any work to which they might be put and not to do exactly the amount of work ordinarily required of a subordinate. He did not think however that it was very much higher than was necessary to meet the average requirements. He admitted that those students of the engineer class who failed to get engineer appointments under government, local boards or municipalities accepted appointments as upper subordinates but contended that such men turned out better work than ordinary upper subordinates. Roughly half

the men turned out as engineers accepted appointments as upper subordinates. These men had better prospects as they had more advanced training than the ordinary upper subordinates all of whom, however, got appointments either under government or other public bodies. He admitted therefore that among the upper subordinates there was one class which had received training as engineers and another which had received training only as upper subordinates, but considered that it was impossible to devise a system under which just the number of engineers that were required could be turned out. He thought it would be hard to lay down that students who had passed out of the engineer class should be debarred from accepting appointments as upper subordinates and that the latter should only be recruited from the students who had passed the upper subordinate examination. He did not think that as far as Madras was concerned it did entail any extra expense to government even although a number of men were trained as engineers some of whom eventually became upper subordinates, nor did he think that it would be feasible to have one engineering college for the whole of India as among other reasons the classes there would be too large and one professor could not teach more than a limited number of students.

2,617. The fee for the engineering course was Rs. 140 or nine instalments of Rs. 18. The average expenses of a student including fees, books, living, etc., were between Rs. 35 and Rs. 40 a month as a minimum. In all there were 30 scholarships for the engineer class spread over four years. At present 16 were government scholarships, 9 were from the native states, one was from Hyderabad and 4 were University scholarships. All the students who came from Mysore received scholarships throughout their course. The ordinary government scholarship was worth Rs. 15 per mensem, the Mysore scholarship Rs. 30, the Hyderabad one Rs. 75 and the University scholarships from Rs. 20 to Rs. 28. Government had also recently sanctioned three scholarships annually of Rs. 30 for 4 students who took up electrical engineering.

2,618. The expenses of the students in the probationary course were not very much less and amounted probably to about Rs. 30 a month including fees, books, clothing, etc. Their fees only were less. For the upper subordinate class the fees were Rs. 70 and for the lower subordinate Rs. 40 per annum.

2,619. The system of having mixed classes for upper and lower subordinates was introduced when the educational qualification for the upper subordinates was the first arts and for the lower subordinates the matriculation examination. It was then found that some of the upper subordinates would not make good subordinate engineers, but that on the other hand there were among the lower subordinates men who showed promise of becoming very useful in the subordinate ranks. The system of having mixed classes was then introduced so that selection could be made of men who gave promise of proving suitable for appointments as upper subordinates. He could say from experience that the system was quite satisfactory. He did not agree with the suggestion that the lower subordinate class should be abolished and that facilities for the training of this class of men should be afforded in technical schools. It would be an advantage from the point of view of the upper subordinates as the superior staff would be able to give their undivided attention to them, but from the point of view of the lower subordinates it would be very bad as they learnt a good deal by coming in touch with men of the upper subordinate class. He admitted, however, that a drawback of the present system was that the students of the college, some of whom were to be officers and others who were to be their subordinates, lived and messed together on terms of intimacy, but stated that this was being guarded against in the Madras college to a certain extent by providing separate hostels for students of the engineer and subordinate classes.

2,620. The year set apart for practical training was ordinarily spent in a Public Works Department division. There were no private works which could provide practical

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training to students of the college except the Madras Corporation with which arrangements had been made to enable certain students to spend a year with them. It was however a disadvantage that neither the Corporation nor the Port Trust would take a student without the payment of fees. Formerly a very heavy premium had had to be paid to the Madras railway also but this had lately been cut down. Half of the fees in such cases were refunded by government. During this period of training a subsistence allowance of Rs. 25 for students of the engineer class and Rs. 20 a month for students of the upper subordinate class was granted by the college. The University did not confer the degree of B. E. until the passed candidate had put in a year on works. Apart from the University degree there was a college diploma also. The students were given marks for their work—theoretical as well as practical—throughout their course and the conferring of the college diploma depended on the marks thus obtained. The college diploma was therefore rather a guarantee of training than of the mere passing of an examination. This diploma was more common than the University degree as students of average ability could get it, it being a more different matter to obtain the University degree which in a way also conferred a higher status.

2,621. Except for the course in mechanical engineering there was no arrangement for specialization in the Madras Engineering College. The witness had made proposals for specialized courses but a committee after considering the question had come to the conclusion that it would not be proper to permit early specialization in any particular branch of civil engineering, since it could hardly fail to be detrimental to the general theoretical training of students. He agreed with the committee and suggested that the proper thing would be to have post-collegiate courses in special subjects either directly or sometime after the students had passed the college course. Such special courses, although really intended for men who had a proper grounding obtained in the ordinary engineering course, might also be open to other persons who might desire to join. He stated that there was no arrangement for teaching architecture in the Madras college. The ordinary college course at present included some elementary training in municipal and sanitary engineering and he contemplated a specialized course for that purpose.

2,622. When the witness became principal of the college ten years ago the subordinate staff was very poor. The men themselves had had little practical experience, and had absolutely no prospects before them, and were discontented as they were drawing only Rs. 60, 80 or 100 a month. He had then made proposals, based on the recommendations of a reorganization committee approved by government to consider matters relating to the college, that the subordinate staff of the college should be placed on the cadre of the Public Works Department and that the college should draw men from that Department for periods of three years whenever they were required. This had been sanctioned and was the system now in vogue. If a particular man were found unsatisfactory he was reverted to the Public Works Department, but he saw no objection to keeping a man longer than three years if he were extraordinarily good unless the man

himself objected through fear of losing his chances of promotion in the Department. He considered this to be not only the most satisfactory method of recruitment but the only possible one which he could think of under existing conditions in the Madras Presidency. He admitted that, if assistant instructors with good practical experience were available and he could pay them what he pleased and get rid of them as he liked, that would be a better system of recruitment but he explained that such men were not available. He laid great stress on the importance of practical experience for the teaching staff and thought that that was the most pressing of all considerations. He suggested that a certain proportion of the superior college staff should also be similarly recruited from the Public Works Department and that men with special qualifications as irrigation or building engineers might be brought on to the college staff for a period of five years. He did not however suggest that all the professors should be recruited in this way.

2,623. He thought that, when the new college building at Guindy was completed, sufficiently large workshops would be available for the practical training of students so far as that was possible in a college.

2,624. (*Mr. Cobb.*) He admitted about 30 students every year to the engineer class though the rule confined the number ordinarily to 20. It was possible for students who failed to get admission into the engineer class to join the probationary class but this was not very often the case and generally such students took up some other profession. Out of the 168 students who had applied for admission to the engineer class last year 100 only were really eligible for selection, the others not being properly qualified. Out of the 100 only 30 had been admitted. As far as engineers were concerned he considered that there was a sufficient field for selection as the number of students admitted was generally twice the number of men required for employment in the Public Works Department.

2,625. He did not agree with the view that in order to get younger men into the college the students should receive their general education in the engineering rather than in the Arts colleges and was of opinion that general education should be completed in the Arts colleges.

2,626. (*Sir Noel Kershaw.*) If it were proposed to educate a class of contractors it would, he thought, be possible to give them some instruction in the college. They would have to be given a sort of mixed training—ordinary training as lower subordinates combined with accounts and practical instruction. The college could arrange to give instruction in regard to the prices of materials and to the methods of buying. He doubted, very much however whether the real practical training that was so essential could be arranged for by placing such men as apprentices with big contractors. He did not think that the average contracting firms in India would, even on the payment of premia, instruct other people in their methods of work. He admitted that he did not know much about these firms as there were no such firms in the Madras Presidency, but he knew that it was difficult in England to get firms to give such instruction.

M. R. RY. T. R. VENKATESA AIYAR, B.A., Engineer and Architect, Madras.

Written Statement.

2,627. (*Qualifications.*) (1). Graduate of the Madras University.

(2). Holds the engineer subordinate diploma of the Madras Engineering College and was the medallist of his set.

(3). Served in the Public Works Department as a permanent upper subordinate for about 4 years in the Mopad Project Division in the Godavary and Kistna Deltas in the River Conservancy Division, Godavary.

(4). Served in the Madras Engineering College for about 3 years, as an assistant instructor.

(5). Resigned service in the beginning of 1912,

(6). Set up private practice and opened an office as R. S. Manian & Co., engineers and contractors.

(7). Engaged in preparing schemes for light railways in the Nellore district; the Godavary light railway scheme for Messrs. McLeod & Co. of Calcutta. Engaged in preparing scheme for the Tanjore-Tiruvadi petrol tramway scheme for Messrs. Shaw Wallace & Co., Madras.

Constructed the Ashonam taluk office and other smaller works both in and out of Madras.

Engaged in consulting work for a few firms in Madras and other private individuals.

(8). "Editor and Proprietor" of the *Indian Engineer*, a monthly journal devoted to engineering science and

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industry, being run for the past 15 months with a fair circulation all over India.

2,628. (I.) **Economy and suitability of methods of execution of public works.**—The methods adopted at present for the execution of civil works are only apparently economical and not suitable for the purpose for which they were devised. The whole Department depends for all initial reports and correctness of material used and the due execution of works as per specification upon the *mistri* who is invariably in the secret pay of the contractor and the present-day contractor generally knows absolutely nothing about the class and nature of work entrusted to him. The whole lot of higher officials depend upon the endorsements and reports and mainly the papers. The overseers represent a class of officials who are neither officers nor subordinates. All the schedule of rates and specifications are being used against contractors who are not in the good graces of the engineer officers of the Department. If the government officials say that the departmental methods of construction are far superior to those of work done by contractors, the whole fabric falls to the ground, when you see from the final figures for works executed departmentally, that there is not a proportionate saving, which the contractor is expected to get as profit, in the usual course.

2,629. (II.) **Encouragement of other agency.**—Under the existing system private enterprise of an organized kind, far from being encouraged, is systematically boycotted and kept down, particularly in this province. It is absolutely to the interest of government and the public to encourage private enterprise of an organized kind by entrusting to them the execution of a certain class of public works. If proper recognition is given to such private agency, surely a number of respectable firms will be prepared to take up such works and the government need not even strain themselves much in any direction. Such change should be effected on the following lines:—

(a). In the same way as the law courts maintain a class of lawyers, the engineering department ought to maintain a class of contractors. They should prescribe a set of qualifications to enable firms and individuals to be included in the departmental lists. The A. M. I. C. E. examination or a degree examination of an Indian university or an apprenticeship for a few years coupled with a diploma may be made the qualifying test for individuals to be registered as contractors.

(b). They must be ranked according to their financial worth, i.e., say works up to Rs. 10,000 to be tendered for by a class of contractors with a certain set of qualifications and financial worth of a particular class. The financial worth is the most important factor. The set of present-day contractors are almost invariably men borrowing at usurious rates of interest and depending entirely upon the *soucar*. So, no individual or firm without a registered name ought to be recognized, and its initial financial stability must be a matter of public knowledge.

(c). **Payments.** The system of payments for work done by contractors and firms in vogue at present in the Public Works Department and other departments is very unsatisfactory and the officers feel very little responsibility. This is due to their lack of training in large firms and works where they deal with banks and know what money means in the real sense of the term. The system of issuing cheques ought to be discontinued. The bills must be payable on presentation at the treasury. The treasury officers may be advised not to honour the bills which are over-dated. The bills must have superscribed on them "not valid after so many days." There is already the rule that the interval of time between the date of measurement and date of preparation of bill and date of passing and payment thereof ought not to exceed certain limits. These rules may be revised.

(d). **Schedule of rates.** This is a record which acts as a rope round the neck of the contractor. The officials as a class shut their eyes completely to the value and importance of this document. A comparative study of the schedule of two divisions will show the absurd way in which these are prepared and the irresponsible way they are maintained. The schedule of rates ought to

be public property and not a secret. Before estimates are sanctioned the quantities and specifications may be circulated among the licensed or privileged and recognized contractors, who may give their quotations. The officers may send up the estimate for sanction with the name of the firm, at their discretion. As it is a set of officials in a hurry and half-informed manner get up estimates and put down their own figures and then hunt after contractors that would be prepared to execute them for their figures. Generally the engineers are at the mercy of their subordinates, who force them under the circumstances to accept any class of work.

2,630. (III.) **Changes in organization.**—There is necessity for modifying the organization of the staff of the Public Works Department.

(a). The number of subordinates ought to be considerably reduced.

(b). The engineer establishment must be strengthened.

(c). The sub-engineer service ought to be abolished and reorganized.

In fact this is the best paid department so far as the provincial Indian service is concerned. Along with the Assistant Engineer there should be a class of engineers known as Extra Assistant Engineers as in the Forest service. Subordinates may be paid as per scale, viz., Rs. 50—5 (annual)—150.

(2). All engineer establishment must be started as probationers on Rs. 150 and confirmed on Rs. 200. When they are absorbed in the full list, they may be ranked as 'Extra Assistant Engineers' with pay Rs. 250—15—550. Such of the probationers as distinguish themselves well may be made Assistant Engineers, who alone will be eligible for the administrative ranks.

(3). The last recognized individual ought to be a man of education (both general and technical) and good character. None below the rank of 'Engineer' should have any status and the responsibilities and duties must be more clearly defined.

(4). Under the proposed system a large number of the subordinates, who now represent the dead weight and mass of the Department preventing progress and improvement, will have no work. Much of the present-day paper work will be avoided by not having too many people to supervise and report and none to actually execute and interest himself responsibly with the work.

2,631. (IV.) **Relations with other departments and sub-branches.**—The relationship between the Public Works Department and other departments is not satisfactory. No government department can afford to be up-to-date in sanitary, architectural and electrical engineering and so these departments must be left to a large extent in the hands of private firms, as is being done in Bengal.

(2). The Madras Sanitary Engineer's work is a standing monument of such failure. The engineers in these departments should have no direct execution at all. It is the tendency of these people invariably to try to get execution also, in the false hope of power. There must be more of thinkers and examiners of designs and schemes submitted by competing private firms. No estimate that has not been publicly criticised ought to be accepted by government. The present-day secrecy is the chief reason for the proverbial corruption of the Department, which at times reaches even the engineer section.

2,632. (V.) **Decentralization.**—There is absolute necessity for immediate decentralization within the Public Works Department. The system ought to be made to coincide with what takes place in the railways. The railways are able to spend large sums of money and deal with big and respectable firms and have a good idea of the commercial aspect of the parties concerned. The system prevailing on the state railways may with some slight modifications be introduced everywhere.

(2). The Chief Engineer, as it is, is lost in the midst of clerical work and he is more a Secretary to Government than a Chief Engineer. This anomaly must be removed.

(3). The Secretary to Government must be a distinct man like the Agent on the railways.

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M. R. RY. T. R. VENKATESA AIYAR.

[Continued.]

(a). *Secretary.*

Chief Engineers or Consulting Engineers.

1. Roads and Bridges.
2. Railways.
3. Buildings.
4. Sanitary works.
5. Electrical works.
6. Architectural works.

These should have nothing to do with actual execution.
(b). The class of 'Superintending Engineers' ought to be reclassified as—

Engineers-in-Chief for construction.

The Assistant Engineer or Extra Assistant Engineer ought to be the man responsible to government for works and payments. The class of 'Executive Engineers' ought to be abolished and such an elaborate office is unnecessary and redundant. The accounts staff may be attached to the treasury. The offices of the Superintending Engineer and Assistant Engineer may be strengthened considerably. The Executive Engineers may be called Deputy Engineers-in-Chief for construction and must be attached personally to the office of the Superintending Engineers. They may spend their time mainly inspecting works and helping the Superintending Engineers or Engineers-in-Chief. There should be more centralization of offices and decentralization of powers of officers. There are at present too many offices and no adequate powers.

(Compare the powers of the other departmental officers of similar grade and pay.)

2,633. (VI.) *Simplification of procedure.*—The Public Works Department Code will get naturally changed and the Code is so ante-dated that the changes will so far alter it, that it would be safer to compile a new Code. This will have to be done in conjunction with the officers of the Accounts Department and an amicable understanding come to regarding accounts. The rest can be easily adjusted. Almost all the forms now in use will need revision.

2,634. (VII.) *Education.*—The engineering college at Madras is being run on the most narrow lines possible and it has no basis at all. It fails to meet even the needs of the main departments, and is turning out a class of butterfly subordinates, who keep humming all over and the engineers are to be seen nowhere. It does not attract suitable candidates, it does not help private enterprises, the standard of instruction is most elementary and under the cloak of practical instruction a good deal of precious time is actually wasted. The fact that the engineers turned out are not quite good will be seen from the records of the Indian engineers appointed.

(2). The college courses must be revised. Civil engineering must be separated from the other subjects like electrical and mechanical engineering. The new engineering college at Guindy must have nothing to do with civil engineering. That must develop into an institute for mechanical and electrical and technological subjects.

(3). The existing buildings are enough for teaching civil engineering in all its branches and are beautifully centrally situated both for the University offices and Public Works Department offices. The class for subordinates ought to be removed from this institution and schools under the management of the Chief Engineer opened at suitable places. This will remove much of the corruption due to non-local men filling in small salaried posts as subordinates. The engineering college must have only one class of men to train, *viz.*, engineers and engineers *alone*.

(4). Graduates may be admitted and if necessary even intermediate men. The theoretical course can be easily gone through in two years. Much of the time at present is absolutely wasted in the college, mainly in going through subjects which the student has already learnt. The students who thus have a good grasp of the theory may be made to specialize in any one branch of civil engineering if they want to qualify for administrative work. In all cases the practical course should be for about three years. Specialists must be asked to deliver lectures in their special branches. Students must be freely allowed to select their own masters for receiving practical training. Engineers in private firms also

must be selected for delivering a course of lectures. The college must on no account be made a field for speculation either for the student or the professor.

(5). A list of firms both in Madras and outside ought to be maintained, where students may receive practical training. For practical training there should be no provincial limit and *all India* must be the sphere, because engineering is not a local science or laboratory work.

(6). There should be an examination at the end of the three years' training and this must qualify him for an honour's degree. At the end of two years' practical training there should be a pass examination for students who wish to qualify for general engineering work. There should be no age-limit; engineering education as imparted now is more a drug administered to a sick patient in doses rather than a food for a growing man. In this respect correlation with the medical studies and courses will be ample and relieve much of the existing heart-burning and remove all the evils of the engineering college life. The college authorities should only grant certificates of attendance and not marks as is being done now.

(7). The guaranteed appointment system ought to be abolished. The Chief Engineer must select from his probationers, by competitive examination, on the nominations made by the Superintending Engineers. As it is, the Chief Engineer has no adequate scope for comparing the merits of men recommended by the various Superintending Engineers.

(8). No man without proper technical qualifications ought to be promoted to administrative rank, *i.e.*, to the rank of Executive Engineer. There should be professional examinations of a better kind for Assistant Engineers before they are made Executive Engineers. Most of the present-day Executive Engineers do not possess enough engineering or accounts knowledge. They consequently depend upon their office and the result is delay and confusion and waste of time.

2,635. (VIII.) *Practical training.*—The practical training afforded by the Public Works Department, as the sole master, is quite inefficient and is more a curse on the student. The students are treated like subordinates and full work is extracted from them. So, during practical training, they must be under the professors of the college and private firms and engineers may take apprentices, whose progress must be checked by the professors. The Public Works Department should not take so many students. The students should be attached to the offices of the Superintending Engineers and not to district engineers. The Superintending Engineer may know better how long a student should stay at a place and at a work. Further, complete records are available only in that office.

(2). The government guaranteed appointment must be immediately removed or nominations must be made, before the training is given, to a few capable men and they must be made to undergo a course, as in the Police and Forest services, and not a course and then nomination.

2,636. (*General.*) In general, so far as roads and buildings are concerned, the state of affairs is most deplorable. A variety of agencies are executing works, *viz.*, Public Works Department, Local Fund, *Taluk* Boards, Police and Forest Departments, Municipalities and private agencies like planters and mill owners. This means dissipation and no progress can be expected and there should be a better system and organization.

(2). The district board engineer should not be under the I. C. S. presidents. This is essential since large grants are given to district boards by government. Until the day when the district board president will be an engineer, as in the Port Trusts and River Commissions, all public works must be concentrated in a Chief Engineer for roads and buildings essentially or preferably a Royal Engineer officer, who must be only Chief Engineer and nothing more. The district board engineers ought to be under him and there should be no special service distinct from the Public Works Department. The scales and rates of pay must be uniform with those of the Public Works Department and only the salary must be debitable to the various heads.

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* M. R. RY. T. R. VENKATESA AIYAR.

[Continued.]

(3). Until the engineering establishment of the district boards is reorganized and brought into line with the Public Works Department no material improvement in the roads will come, as they control all the roads. The machinery for execution of works must be of uniform capacity in all departments. The Chief Engineers for roads and bridges and sanitation may work under the Secretary for the Local and Municipal Department if necessary. No Chief Engineer should be a Secretary to Government and that post must be held by an L. C. S. man or of equal status and capacity.

(4). The main reason for the above change is the incapacity of the men recruited for the engineering department to deal with general subjects, and the Chief Engineers are not already able to cope with their office work and any number of Deputy Secretaries cannot improve the tone and capacity of the office, and as such immediate action is necessary if the Department is to serve really the purpose for which it is maintained by the state.

(5). No doubt, a body of aristocratic engineers and a set of illiterate and non-self-respecting contractors may get on well for some time. But when the collapse comes under stress of new conditions imposed by the new expanded and expanding Councils of the various governments, it may become impossible to mend the machinery, and it may be asked already whether it is not a matter for doubt if the proposed overhauling will really make the machinery up-to-date.

(6). The changes proposed by me will, it is hoped, infuse really better life into the Department, and any initial extra expenditure will be amply repaid in the next few years only and on the other hand, if the Committee should acquiesce in the self-complacent view of the officials, whose vision is naturally dim and who have an unnatural fear that their present position will be shaken, the government may always labour under a difficulty, if an emergency should arise demanding better talent and more concentrated action such as the present war has called forth from all concerned.

M. R. RY. T. R. VENKATESA AIYAR called and examined.

2,637. (President.) The witness stated that he had been employed in the Public Works Department and that he had resigned his appointment in the year 1912. He had received a training in the Madras Engineering College as a sub-engineer, an appointment which corresponded to that of the present Public Works Department upper subordinate, and had since his resignation taken up private practice as an engineer and architect.

2,638. He was at present employed by a group of financiers as their engineer and agent for the survey and promotion of light railways, and his experience of building contracting work was acquired in the *mofussil*. He had not taken up building work in Madras city itself as the Executive Engineers had not registered his name as a contractor although he made the request no less than three times. His name had been registered in a division in the *mofussil* in which he had formerly served but he had failed to secure registration in the other divisions. The system of registering contractors was a relic of the days when it was necessary to have on record the names of contractors whose financial worth, capabilities and character were known, and it was then the practice to divide these into three groups, the first for all works; the second for ordinary works and the third for petty works, and to regulate promotion from one group to another by the quality of the work actually done. As far as he was aware the present list of contractors, however, did not maintain this distinction.

2,639. He recommended that contractors might be registered with reference to their financial position and engineering qualifications, and added that a man's financial capacity could be gauged from his bank references as was done in the commercial line. A man with a capital of Rs. 5,000, for instance, might be considered as possessing financial support. It was true that the majority of the present contractors were financed privately, but in such cases they usually paid as much as 24 per cent. interest for the accommodation. Public Works Department works costing less than Rs. 1,000 were entrusted only to registered contractors.

2,640. In his opinion a great deal of the practical knowledge gained at present by contractors during the course of construction of works was not made full use of and was lost not only to India, but also to generations yet unborn. The reason for this was that, except in the case of a few large works, no details were published in periodicals, and hence little of what was being done in the country was left on record. The omission from periodicals of the smaller details connected with works was, he considered, due to the absence of an engineering knowledge on the part of contractors. For these reasons he suggested that no contractor ought to be employed by the Public Works Department unless he possessed some engineering qualifications. Under the present system the Public Works Department subordinates did a lot of a contractor's work in that they prepared the latter's bills, but this would not be necessary if educated

contractors were employed. No man, he considered, ought to be allowed to practise as a contractor unless he possessed either the A.M.I.C.E., or B.E. degree and had received a course of practical training. He modified his recommendation so as to include upper subordinates who had obtained the diploma of the Madras Engineering College but was strongly opposed to the inclusion of lower subordinates. He here complained that the Public Works Department preferred to accept tenders of illiterate, rather than literate contractors, and suggested that literate contractors should be paid at higher rates than illiterate ones.

2,641. In support of his contention that the Public Works Department schedule of rates operated against contractors, he stated that the schedule was usually prepared about February when it was submitted to the Chief Engineer for sanction who returned it to the divisional office about the 1st of April. There was thus the possibility of a fluctuation of prices in the *interim* and, though representations were sometimes made, in the absence of a regular agreement no more than the schedule rate was allowed. It was true that the agreement was intended to cover all items, but sometimes important items were omitted. In his opinion the schedule of rates was detrimental to contractors, in view of the fact that all works were not given out on contract. He was also opposed to work being given out piece-meal.

2,642. He advocated the discontinuance of the practice of making payments to contractors by cheques and urged that payments might in future be made by the treasury, as he had found from personal experience that the payment of contractors' bills was delayed unnecessarily, and they could obtain no redress.

2,643. He suggested that the Secretary to Government in the Public Works Department might be an officer unconnected with the Public Works Department as was the case at present on railways, and that Chief Engineers and Superintending Engineers might in future be designated Engineers-in-Chief and Engineers for Construction. In support of his latter recommendation he added that the activities of the Public Works Department were at present practically confined to construction work, and that maintenance work was undertaken chiefly by district boards.

2,644. He also advocated that the district boards' engineering staff should be transferred to government and placed under the control of the Public Works Department in order that the status of a district engineer might be regarded as that of an adviser rather than a subordinate, and stated that his suggestion was based on the fact that there were already in districts advisers to the district board in the education, sanitary and other departments. His proposal, however, did not include *taluk* boards which, he considered, might employ their own engineers.

2,645. The quality of buildings erected by the several district boards in the presidency was poor, and their

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[Continued]

life was short owing to durable materials not being utilized, consequent on the boards not being prepared to spend sufficient money on their buildings.

2,646. He suggested the abolition of Executive Engineers and their replacement by Assistant Engineers with three or four subordinates under them as was done on railways which were the largest spending agency in India. In his opinion sub-engineers ought also to be abolished as they formed a heterogeneous mass of individuals with varying degrees of intelligence, inasmuch as they comprised engineer B.E. students and upper subordinates. He added that the subordinate establishment would automatically be reduced to the extent of two-thirds if the system suggested by him of giving work to engineer contractors were adopted.

2,647. (*Sir Noel Kershaw.*) The only two Public Works Department contracts he had undertaken were a large *taluk* office which cost about Rs. 30,000, and a portion of another such office valued at about Rs. 4,000. He made no profit on either work and as far as he was aware no complaint was made with regard to his work. He had only taken to consulting work because he did not desire to accept further work from the Public Works Department. He had not made any profit on the Public Works Department contracts he had undertaken because he had tendered at too low a rate and the specifications were not shown to him till after he had signed the agreements.

2,648. He considered the Public Works Department schedule of rates to be 'a rope round the neck of the contractor' because Public Works Department subordinates, in order to induce a particular contractor to undertake a work, generally promised to secure him a specified rate. The work would then be proceeded with without the signing of an agreement by the contractor, and on its completion he would be told that only the rate allowed in the schedule was permissible. He attributed this practice to the fact that too much favour was bestowed in the Public Works Department, and questioned the necessity for keeping the Public Works Department schedule of rates confidential. His past failures, he added, were not due to the fact that he had been unfortunate in the receipt of favour.

2,649. (*Mr. Mackenzie.*) With reference to his statement that the specification for the *taluk* office erected by him was not shown to him till some time after he had signed the agreement, he mentioned that when it was eventually shown to him he found it to be a special specification and more difficult than he had anticipated. He added that had he known that the specification was a special one he might, in the first instance, have tendered for

higher rates. It was his experience that for Public Works Department works specifications were not laid down, and only a set of type plans were ostensibly attached to the agreement. In practice, however, these plans were really never attached, and in addition the specifications varied in the quantity of brickwork, and in the proportion of lime.

2,650. (*Mr. Cobb.*) The Public Works Department rates were not at all reasonable as they did not allow for setting out, supervision and night watchmen. Besides wastage was allowed for in some divisions while in others it was not. Everybody could not ascertain the schedule rates as they were kept confidential.

2,651. (*Mr. Howley.*) In support of his statement that works were started without the contractor having been shown a complete set of plans, he remarked that personally he had never been able to secure a copy of the plan and specification which it was alleged was available to the contractor in the sub-divisional office. He therefore urged that complete tenders accompanied by plans and specifications should be sold to intending tenderers rather than be shown to them nominally in the office, as was the procedure in the Madras Corporation. He added that the necessity for the supply of plans to contractors was not removed by their ignorance of English as though they might not be able to read an estimate, it was quite probable they could understand a plan.

2,652. He had not complained that the main items of an estimate were frequently omitted in an agreement but that additional items were often introduced and mentioned that in a certain work a particular rate had been added after its commencement. He added that though such a practice might work well with illiterate men literate men would not tolerate it.

2,653. He admitted that if his suggestion for the abolition of two-thirds of the present subordinate establishment were put into force it might not be possible for the remaining one-third to undertake all measuring work. He therefore suggested that the engineer contractors he had proposed might themselves measure works and submit their own bills. This he considered would involve only a day's inspection of works by the Executive Engineer instead of the present prolonged inspections of two or three individuals during the course of about fifteen days.

2,654. (*President.*) When he was an assistant instructor in the Madras Engineering College he endeavoured to induce students to take to contracting by pointing out its advantages, but he had not been able to convince any of them. As far as he was aware he was the only passed engineer in the Madras Presidency who had taken up Public Works Department contracts.

LIST OF APPENDICES.

- I. Officials and non-officials in Bombay, the Central Provinces, Bengal and Madras who furnished written evidence to the Public Works Department Reorganization Committee in connection with their inquiry but who were not orally examined.
- II. Memorandum prepared by the Government of Bombay.
- III. Note by the Hon'ble the Chief Commissioner of the Central Provinces.
- IV. Memorandum prepared by the Administration of the Central Provinces.
- V. Note by the Administration of the Central Provinces on the system adopted in the Central Provinces for the execution of public works by local bodies.
- VI. Letter from the Hon'ble Mr. H. H. Green, Secretary to the Government of Bengal, Public Works Department, to the Secretary, Public Works Department Reorganization Committee, No. 492-E, dated the 29th January 1917.
- VII. Memorandum prepared by the Government of Madras.

APPENDIX I.

Officials and non-officials in Bombay, the Central Provinces, Bengal and Madras who furnished written evidence to the Public Works Department Reorganization Committee in connection with their inquiry but who were not orally examined.

Bombay.

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| <ol style="list-style-type: none"> 1. F. C. Taraporvala, Esq., C.I.E., Superintending Engineer, Public Works Department (retired). 2. O. H. L. Napier, Esq., Conservator of Forests, Central Circle, Poona. 3. Rao Bahadur R. C. Artal, I.S.O., District Deputy Collector (retired), Belgaum. 4. Sardar Khan Bahadur Rustomji Jehangirjee, Vakil, Ahmedabad. 5. E. M. Duggan, Esq., B.Sc., A.M.I.C.E., Executive Engineer and Under Secretary to the Government of India, Public Works Department. 6. J. H. Advani, Esq., Professor, College of Engineering, Poona. | <ol style="list-style-type: none"> 7. H. J. M. Cousens, Esq., B.Sc., Executive Engineer, Bombay. 8. T. S. Pipe, Esq., B.Sc., A.M.I.C.E., Executive Engineer on Special Duty, Karwar, Kanara. 9. The Hon'ble Mr. G. H. Thiselton-Dyer, M.A., A.M.I.C.E., Mechanical Engineer to Government, Poona. 10. R. B. Joyner, Esq., C.I.E., M.I.C.E., Superintending Engineer, Public Works Department (retired). 11. H. G. Jassing, Esq., B.E., M.R.S.I., (Hon.), Shikarpur (Sind). 12. Messrs. Phatak and Walchand, Ltd., Engineers and Contractors, 158 Foras Road, Bombay. |
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Central Provinces.

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| <ol style="list-style-type: none"> 13. Khan Bahadur Byramjee Postonjee, Contractor, Nagpur. 14. E. A. Lugard, Esq., Executive Engineer, Jubbulpore South Division. 15. C. M. B. Mersh, Esq., A.M.I.E.E., Electric Inspector, Central Provinces. 16. P. Davies, Esq., A.M.I.C.E., Executive Engineer, Central Provinces. | <ol style="list-style-type: none"> 17. C. A. Clarke, Esq., I.C.S., Deputy Commissioner, Nagpur. 18. The Hon'ble Mr. M. B. Dadubhoy, C.I.E., Barrister-at-Law, Nagpur. 19. P. Hira Lal, Esq., Divisional Engineer, Nerbudda Division. |
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Bengal.

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| <ol style="list-style-type: none"> 20. The Hon'ble Mr. W. W. Hornell, M.R.A.S., M.A., Director of Public Instruction, Bengal. 21. Rai Bahadur Kumudini Kanta Banerji, M.A., Principal, Rajshahi College, Rajshahi. 22. Messrs. Kar & Co., Engineers and Contractors, Calcutta. 23. Bengal National Chamber of Commerce, Calcutta. 24. Bengal Chamber of Commerce, Calcutta. 25. Rao Sahib Pandit Matadin Sukul, M.A., Executive Engineer, Nadia Rivers Division. 26. R. J. Browne, Esq., M.I.E.E., Electric Inspector for Bengal and Assam. 27. H. C. Vieyra, Esq., B.E., Executive Engineer, Burdwan Division. 28. A. Mellor, Esq., I.C.S., District Judge, Khulna. 29. N. N. Rakshit, Esq., Messrs. Sikdar & Co., 5 Hastings Street, Calcutta. | <ol style="list-style-type: none"> 30. A. C. Mukerji, Esq., B.A., C.E., Private Engineer, 82 Haris Mukerji Road, Calcutta. 31. S. M. Ghatak, Esq., Contractor, Tangail. 32. C. K. Sarkar, Esq., C.E., M.S.A., M.S.E., Consulting Engineer and Architect, 10 Hastings Street, Calcutta. 33. N. K. Sarkar, Esq., Contractor, 5 Hastings Street, Calcutta. 34. A. C. Banerji, Esq., A.M.I.C.E., M.R.S.I., Assistant, Messrs. Jessop & Co., Engineers, Calcutta. 35. H. H. Jellett, Esq., B.A., B.A.I., T.C.D., M.I.C.E., Chief Engineer, Bengal Nagpur Railway, Calcutta. 36. P. C. Bhattacharya, Esq., B.A., B.E., District Engineer, Bogra. 37. The Calcutta Electric Supply Corporation, Ltd., Calcutta. 38. The Hon'ble Dr. Deva Prosad Sarvadhikary, C.I.E., Vice-Chancellor, Calcutta University. |
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Madras.

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| <ol style="list-style-type: none"> 39. S. G. Roberts, Esq., I.C.S., District and Sessions Judge, South Arcot, Cuddalore. 40. Rao Bahadur Dr. C. B. Rama Rao Avl, M.D., V.H.A.S., District Medical and Sanitary Officer, Tanjore. 41. W. Stokes, Esq., M.B., C.M., Superintendent, Government Lunatic Asylum, Calicut. | <ol style="list-style-type: none"> 42. H. T. Reilly, Esq., Sub-Collector, Dindigul. 43. M. R. Ry. A. V. Ramachandra Ayyar, A. Can. Soc. C.E., Architect and Engineer, Madura. 44. The Secretary, Lower Subordinate Association, Madras. 45. A. Newmarch, Esq., Accountant-General, Madras. |
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APPENDIX II.

APPENDIX II.

Memorandum prepared by the Government of Bombay.

(i). *Whether the methods adopted for the execution of civil works are economical and suitable for the purpose for which they were devised.*

1. All the Engineers in the department who have been consulted are agreed that the methods at present adopted for the execution of civil works are in all respects economical and suitable for the purpose for which they were devised.

In Sind, civil works are carried out by contract—otherwise private agency—under strict Government supervision. In special cases where highly technical or new forms of construction are employed such as the use of re-inforced concrete departmental agency in construction is obligatory because of the total lack of technical knowledge on the part of the contractors. These contractors are merely suppliers of labour and materials and nothing else, and the present methods are the most suitable for Sind for an indefinite period to come.

Most of the work in Sind is irrigation work and with the exception of Karachi Buildings district where an Executive Engineer will always be required, the Irrigation Engineers look after the Roads and Buildings work as well.

2. In the Deccan and Gujarat as much as possible of the work is carried out by contract. Endeavour is always made to obtain contractors as far as possible. No Executive Engineer wishes to carry out work by departmental agency or petty piece-work if he can obtain a contractor who will do it at reasonable rates as departmental and petty piece-work methods give the department a great deal of extra trouble and labour in measurements, accounts, etc., which it is the aim to reduce to the minimum possible. Large contractors at present are difficult to obtain as a rule outside the bigger cities and the department has to fall back to a large extent on petty contractors and piece-workers. Much of the minor works in a district such as repairs to buildings and roads must be done by departmental work as the quantities in many cases are not easily determinable and measureable. The contractors in the Deccan and Gujarat are, like those in Sind, generally only suppliers of labour and materials, relying on the officers and subordinates of the Public Works Department for proper supervision, advice and guidance in the execution of the works.

3. The fact that departmental agency and piece-work has to be employed very largely is the natural outcome of the great scarcity of contractors in the country and that scarcity makes it necessary to retain the power of departmental work as a defence against contractor rings and to secure economy in construction. The methods employed by the department for the execution of civil works are based upon the accumulated experience of years, as best suited to prevailing conditions, and are not *per se* inefficient and out of date. That they are not the methods adopted in Europe and other more advanced countries is well known but Indian conditions are widely different from those obtaining in Europe and America where high rates of wages make the extensive use of all sorts of labour saving devices an absolute necessity if works are to be executed at reasonable cost, and capital attracted to finance them.

Until recent years the pay of the Indian labourer has been so low that he has been able to compete successfully with machinery. But the economic conditions in India are changing rapidly and this must react in the direction of the more extensive use of modern plant and methods. In the big cities such development is already taking place and much of the work which a decade ago was undertaken by hand is now performed by machinery.

No doubt the young engineer when he first joins the department, and the representatives of big engineering firms in the country who have plant of all kinds for

sale, are apt to denounce the slow and to them antiquated methods of the East, but their views, particularly those of the former, usually undergo a remarkable change under the burden of responsibility when they come into close daily contact with the inertia of Indian labour and the difficulties in the way of getting things done.

4. To ascertain whether work is being done economically or otherwise examination must be made of the cost of the Architect's or Engineer's work and his supervision, and of the rates for work and material; another factor which may also have to be taken into account is celerity in execution.

It is believed that Railway Companies as a rule pay much higher rates than the Public Works Department though there is little difference in the quality of the work done. On Railway works time is usually a factor of great importance and the higher rates they pay may be justified by the need of economy in time.

In their letter No. 903-A.G., dated 3rd September 1912, the Government of India invited a discussion of possible economies in carrying out Public Works Department work. A copy of this Government's reply No. A.—366, dated 13th January 1914, Public Works Department, is attached (Annexure I). A comparison made at that time of rates paid for work and materials by certain architects and mill-owners in Bombay and Ahmedabad with the rates paid by the Public Works Department disclosed little difference between the two and though it was conceded that private persons might get individual pieces of work done more cheaply than Government, it was considered probable that the work would not be of the same quality and that private work might not prove more economical if it were on a larger scale and carried out, not in favourable conditions only, but also in unfavourable. The Public Works Department do the best quality of work at comparatively low rates. With the advent of the Consulting Architect and the continued expansion of his field of work a great improvement has been effected in the design of buildings. This improvement naturally costs money; but it is money well spent.

5. It is sometimes urged that the style of building preferred by the Public Works Department is more solid and substantial than need be and that on this account their work is not economical. But this high standard is not an inherent defect in the organization. The standard may be raised or lowered according to the policy approved. It must be borne in mind, however, that the poorer the class of construction used the more money must be spent on future yearly repairs and it can be shown that it is true economy in the long run to put up the best class of work. It is well known that Public Works Department work is infinitely superior to the bulk of the work carried out by private agency even in a place like Bombay where so much building work is done.

6. The incidence of establishment charges is illustrated in the attached statements and diagrams, *vide* Annexure II (a) to*(g) inclusive. These have been prepared for work done in the Roads and Buildings Branch only. A more complete view would be obtained if all work done by the Public Works Department were included. Figures for all the work including irrigation, are given in the statement marked Annexure II (e). In studying the effect of the Roads and Buildings figures several important points have to be considered. In the first place the bulk of the work done by the Department for local bodies, and of contribution works is done by the Roads and Buildings Branch and as the charge made on local bodies on account of establishment is 10 per cent. and for contribution works may be less or nothing at all the deficit between recoveries and actual cost of

* Annexures II (f) and (g) not printed.

establishment on these works goes to raise the percentage on Government work. Secondly no establishment is charged against famine work. Another point of particular importance is that on account of the uncertainty of the rainfall, years of financial stringency recur not infrequently. In these years the grant for Roads and Buildings is the first to be reduced in order to secure the enforced reduction of public expenditure. Thus while the expenditure on Irrigation either remains constant or is slowly expanding or slowly contracting, that under Roads and Buildings is liable to sudden fluctuation and in a year of diminished activity following on a year of great activity the establishment percentage necessarily works out to a comparatively high figure. Lastly the cost of establishment covers much work done in the investigation and preparation of schemes. Taking these points into consideration and bearing in mind that the work is scattered over a wide area the figures do not disclose any strong ground for holding that for the work done the machinery is unnecessarily expensive. Curve C in Annexure II* (g) shows the percentage which establishment charges bear to the cost of the work, excluding the cost of establishment and omitting the cost of direction and accounts. In 1913-14 the percentage was 11. Whatever system might be adopted the expenditure for direction and accounts must remain and if another agency is employed account will have to be taken of the cost of the Government inspecting staff.

7. Where a waste of energy and therefore of money does occur is in the close supervision which has to be exercised over the subordinate staff. It is a general complaint that the subordinate staff are apt to be lacking in alertness and intelligence if left to themselves, and there is evidence that, subjected as they are to great temptations, there is among them an undesirable amount of corruption. This may be got rid of by improving their pay and prospects, by increasing the mobility of the supervising staff and by such a decentralization as will give the Executive Engineer and the Superintending Engineer more control over their subordinates. In any case it is hardly correct to say that the close control which is necessary is abnormal. Looking to the conditions prevailing in this country such a state of things is not abnormal and is not confined to the Public Works Department. The same close control would be necessary if work was being done by any other agency and improvement in the matter is not likely to be slower or more difficult under Government than under private or local board agency.

(ii). *Whether under the existing system private enterprise is sufficiently encouraged, and whether it is possible and desirable to entrust the construction and upkeep of certain classes of public works to agency other than departmental, and, if so, upon what lines such changes should be effected.*

1. There are several suggestions underlying this question. The first is that the length to which Departmental activities extend seriously restricts the field open to private enterprise and thereby prevents the normal development of engineering enterprise among the public generally. There is undoubtedly some truth in this view. The Department found no private engineers competent to design and construct buildings in a workmanlike manner and consequently had to make their own arrangements. They have always been ready to hand over as much of the work as possible to private agency but that agency has been represented almost entirely by contractors who can do no more than collect and organize the labour and arrange for the supply of the material. It is only in recent years that a higher class of agency has begun to make its appearance. The position is correctly described in the following extract, from a letter from the Commissioner in Sind:—

"In so far as the great majority of public works are already carried out through private contractors, private enterprise may be said to be sufficiently encouraged.

* Not printed.

It must be recognised that private enterprise in the building trade is still in the initial stages of its growth. It is only necessary to compare the public buildings which Government have erected, with the ordinary style of buildings erected by the inhabitants of the neighbouring towns, (leaving out of consideration the palaces and temples which were constructed in bygone days regardless of cost), in order to perceive that British rule has inaugurated a totally new era. The growth of public wealth and the growth of public confidence in the justice of the State have led private citizens within quite recent years to construct their private residences in accordance with a wholly new standard of comfort and convenience and to a great extent with new materials, stone and marble replacing brick, and brick replacing mud. These signs which may be observed in every part of India, betoken the establishment of a new industry and profession.

Speaking generally, as yet this industry is in the hands of the old type of *mistry*; an uneducated contractor who does not know how to take levels or calculate strains, but who has a practical acquaintance with materials and the handling of men. Except in a few cases in such cities as Bombay, the young Engineer trained in the Government Engineering College has not yet entered this field as a contractor; nor has he been able to secure the confidence of the old-fashioned contractor, who seldom or never employs an L. C. E. on his staff. However, there can be no doubt that the building art has rapidly improved in recent years, and is improving; and the credit for this improvement is undoubtedly due to the Public Works Department alone. It must not be forgotten that the Public Works Department has only been in existence for some 40 years, and that it began in a very humble way; even in 1890 there were less than a hundred trained Engineers in the Bombay Presidency to practise and teach their art to a population of 20 millions.

If these premises are correct, the conclusion stands evident that the policy of Government should be patience; that there should be no hasty upheaval of a system whose achievements have been remarkable and that all that is required is the strengthening of weak points and the reform of doubtful tendencies."

2. The conclusions which that officer draws are undoubtedly sound. A private demand has arisen, those who have come forward to meet it have been stimulated by the Architectural work done by the Department and, in Bombay, by the City Improvement Trust also, and it seems desirable that Government should make a call on this new profession in order to stimulate its development. This will not be immediately economical because it will be long before the employment of private agency will permit of an appreciable reduction in the Departmental staff but the object in view is worth some sacrifice. The main difficulty ahead is that Indian firms very rarely pay the proper value for honesty in their employes. If the control and influence exercised by the Architects and Surveyors' Institutes are beneficial at home, such control and influence are still more necessary in India.

3. In the field of road and bridge engineering, there is less scope for private enterprise and where the distances are so great and the need of good roads so important, it is distinctly inadvisable to make any change which might bring a decline in the standard of efficiency already attained.

4. The second suggestion underlying the question is that a portion or the whole of the work done by the Department might be transferred to local bodies. It is urged that if local bodies are encouraged and enabled to arrange more extensively than at present for the execution by their own staff or by private agency of their works it will not only be a further step in the direction of decentralization but also would stimulate the growth of firms of standing in the building and allied trades and encourage further industrial activity. So far as the latter object is concerned the facilities for the development of industrial activity can be afforded in an equal degree whether the works are controlled by Govern-

APPENDIX II—continued.

ment or by local bodies. As regards decentralization, Municipalities in this Presidency make their own arrangements for their roads and buildings and it is only in the case of large works of sanitation or water supply, towards which Government have given a contribution, that they are required to entrust construction to the Public Works Department. There are outstanding examples of good municipal management in the matter of road-making, building and large engineering enterprise, but as a rule in the *mofussil* municipalities the average standard of engineering work, particularly as regards road-making and road maintenance, is distinctly low.

5. As municipalities have a large measure of independence the suggestion must refer chiefly to local boards. None but the most ardent optimist will look for any immediate economy or increased efficiency as a result of the transfer of Government works to local boards. The question is whether it is desirable to sacrifice something of efficiency in order to foster the capacity for Local Self-Government. In this Presidency we should have to make an entirely new departure for the local boards have no engineering staff worthy of the name and many of them have not of their own a sufficiency of work on which a competent staff could be profitably employed. There would be more scope for local board engineering staff if Government transferred to the boards the maintenance and improvement of Provincial roads and the construction and repair of Government buildings, together with the funds necessary for these services. Their work for many years to come would have to be arranged for on the same lines as in the Public Works Department at present. The Government of Bombay have recently been devoting much attention to the possibility of a more progressive policy in the matter of local boards. The preliminary steps have been taken. The constitution of the boards is being liberalized while from some the official element has been eliminated and steps are being taken to provide an efficient executive to do the work formerly done by the official members. Further development depends on the solution of certain questions regarding the control to be exercised by a central authority. Some such control is considered necessary for the State is ultimately responsible for the proper expenditure of funds raised by local taxation and still more so if it hands over part of the public revenues for expenditure by a local body. The local boards at present receive substantial grants from public funds and as their own resources are small and slow of growth, the subventions will have to be increased if progress is to be made. Pending the settlement of this larger question, the Government of Bombay are not prepared to put local boards in funds in order that they may maintain their own engineering staff. There is not room for two agencies, Government and local board, and after all the object in view, namely, the furthering of Local Self-Government, does not depend on the particular agency employed in carrying out work. It depends rather on freedom to determine questions of policy and to decide what schemes should be taken up. Further as there is nothing that hastens the development of rural areas so much as an efficient system of communications the Government of Bombay would be entirely opposed to any change in the agency for the maintenance and improvement of provincial roads unless the new agency is certain to give at least as good results as the Public Works Department have done in the past. They are inclined to believe that ultimately the most satisfactory arrangement will be to provincialise all local board roads of any importance and entirely relieve the local boards of all expenditure in connection with them.

6. The Public Works Department has a large number of irrigation and road projects both ready and under preparation which are well suited for the employment of famine labour.

Famines in this Presidency, particularly in the Deccan districts, have been of common occurrence and though the increase of trade and industry has greatly diminished the danger the contingency cannot be disregarded. The machinery of the Public Works Department from long experience in handling labour and a knowledge of

the country is well adapted to cope with the task of organising and carrying out measures of famine relief.

With the abolition of the present machinery and the substitution of the contract system it would not be easy to cope with a serious famine except at very great expense, and the hurried employment of a supervising agency quite inexperienced in such work.

(iii). *Whether any changes recommended by the Committee necessitate any modification of the organisation of the staff of the Public Works Department, and, if so, what.*

No reply can be given to this point until the changes recommended by the Committee are known.

(iv). *Whether the Public Works Department meets the needs of other Departments of the Administration, and whether the relations inter se of the various sub-divisions of the Buildings and Roads Branch, Sanitary, Architectural, Electrical and Civil Engineering, are satisfactory.*

As to whether the Public Works Department meets the needs of other Departments of the Administration can only be judged by a reference to those departments, but from the replies received to this question from prominent members of the Civil Service it may be answered in the affirmative.

One Commissioner states that he has found the relationship between the Public Works Department and other Departments excellent throughout his service and has never failed to obtain advice and assistance whenever he has asked for it. He points out that at the moment of writing, an Executive Engineer is devoting all his spare time to constructing a system of drainage for a Municipality. Executive Engineers are expected to and do give other officers all the assistance in their power.

2. Relations *inter se* of the various sub-divisions of the Buildings and Roads Branch, Sanitary, Architectural, Electrical and Civil Engineering are satisfactory.

(v). *Whether further decentralization within the Public Works Department itself is desirable, and, if so, to what extent and in what directions.*

It is impossible to give a full reply to this rather intricate question in the short time available.

A substantial amount of decentralisation has been introduced in recent years and at present, conditions appear fairly satisfactory. A few matters which now seem to call for further decentralisation are noted on below.

2. All Superintending Engineers may be given power to accept tenders up to Rs. 50,000, and be allowed to sanction engineering details of works costing up to Rs. 50,000, instead of the figure being restricted to Rs. 20,000. The powers at present enjoyed in this respect by Superintending Engineers are shown in Annexure III.

3. Executive Engineers are at present empowered to grant technical sanction to works costing up to Rs. 2,500. It is thought that this limit may be increased to Rs. 5,000. Their power to accept tenders at present is Rs. 5,000, and this may be increased to Rs. 10,000.

4. Executive Engineers have no power at present to sanction estimates for Tools and Plant. It is thought that they should have this power up to Rs. 1,000.

5. The power of Executive Engineers to grant administrative approval for Provincial Works other than residential buildings and those in connection with Government houses and Ecclesiastical buildings may be raised from Rs. 2,500, to Rs. 5,000. Powers of administrative approval at present delegated to different officers are shown in Annexure III.

6. Executive Engineers may be given greater powers regarding sanctioning excesses on sub-heads of estimates. The extent to which this may be given would require to be considered carefully. This Government has not had time to look into this matter.

7. The powers of Public Works Department Officers regarding purchase of stores are laid down in Appendix

APPENDIX II—continued.

30 of Public Works Department Code, Volume III. It is considered the limits laid down might be safely increased to the figures shown below :—

	For purchases under Rule 3(a). Rs.	For purchases under Rule 5. Rs.
Executive Engineer or Assistant Engineer holding charge of a District	500	1,000
Superintending Engineer	5,000	10,000
Local Government	50,000	Full powers.

It would be a great convenience also if the stores rules were so modified as to allow of a great deal more local purchase, seeing there are so many firms, branches of firms and agents now in India who can quote very reasonable rates for the articles in which they deal.

8. Appointments of persons to the temporary Upper and Lower Subordinate establishment may be left to the Executive Engineer, provided the appointment and scale of pay has been sanctioned by higher authority. The power of dismissing these persons should rest with the Executive Engineer.

9. The Executive Engineer should have full power to make appointments against vacancies in the permanent and temporary staff of his office, subject to the rules regarding admissibility of applicants for appointment being complied with.

10. Selected Upper Subordinates in charge of Sub-divisions may be allowed to make cash payments up to Rs. 200 on bills for work done on running account.

11. Sub-divisional Officers may be empowered to enter into contracts up to Rs. 200, provided the rates are within the general rates sanctioned by the Executive Engineer. This limit may be increased to Rs. 500 in the case of Assistant Engineers holding charge of a Sub-division who are over 2 years standing.

12. Sub-divisional Officers who are Upper Subordinates may be allowed to sanction rates for and purchase materials up to Rs. 100 in value without reference to the Executive Engineer, provided the value is covered by provision in the sanctioned estimate and the rates are within the general rates sanctioned by the Executive Engineer also provided the purchases comply with code rules.

13. Sub-divisional officers may be given more powers with respect to carrying out current repairs to buildings. It should be left to them to a great extent to carry out repairs after consulting the officers in charge of the different buildings and the Executive Engineer can have a useful check if they maintain a concise record of the work actually executed kept up to date and available when called for. If this were maintained and copied monthly in the Executive Engineer's office and the Executive Engineer's expenditure noted in both copies, it would be possible to do away with the register of works, work abstracts and monthly progress reports for these works. At present estimates for these repair works are prepared annually by Sub-divisional officers and checked by Executive Engineers. There is a large number of these works. These estimates are never adhered to except as regards the total expenditure on repairs. It is under consideration to do away with them and substitute a much simpler and suitable arrangement.

14. About six years ago, the Civil and Public Works Accounts Departments were amalgamated. Hitherto discretion has been given to Local Governments to introduce local variations in accordance with the orders contained in the letter from the Government of India, Finance Department, No. 2866-A., dated 30th April 1912. The Government of India now consider that sufficient time has elapsed for experience to have been gained of such changes as have been introduced tentatively and that so far as may be practicable a uniform system of accounts should now be laid down applicable to all provinces. With this object the Comptroller and Auditor General submitted a scheme to the Govern-

ment of India in 1914 and this has been referred to the Local Governments for their consideration after selected officers of the Public Works Department, both of administrative and executive rank, had examined and reported on the proposals. This Government's reply to the Government of India is about to be despatched. The intention is that while securing efficiency and reasonable simplicity and economy of work on the accounts and audit side, full regard should be paid to considerations of administrative convenience. At present that part of an Executive Engineer's duties occupies an undue proportion of his time. If the proposals now under consideration are adopted, there will be a substantial reduction in the amount of accounts work.

15. It is possible that Executive Engineers and Sub-divisional officers could be saved a good deal of office work by a reduction in the number of returns they have to submit. The question requires careful examination before any recommendations can be made.

(vi). *Whether the Public Works Department Code which regulates the execution and maintenance of Civil Works is unduly restrictive, and, if so, in what direction change is desirable.*

The general opinion of officers consulted in the Public Works Department is that the Public Works Department Code is not unduly restrictive.

2. Several points in this connection are dealt with under point (v) which concern the Public Works Department Code, such for example, as increased powers to Public Works Department Officers there proposed.

One argument for increasing the powers of sanction to plans and estimates is that there has been a considerable rise in the cost of carrying out work of late years in India.

3. The present regulations governing the accommodation to be provided in officers' bungalows should be altered. The cost is regulated in proportion to the occupant's pay, regardless of the fact that the cost of building may be considerably greater in one district than another. This could be improved by laying down definite areas of accommodation for different grades of pay and thereby saving a good deal of labour and time in discussion as to the accommodation to be provided.

4. Particular attention is invited to the Stores Rules, noted on in the reply to point (v). It would be a great benefit if the powers permitting local purchase of materials imported into the country were extended and greater freedom allowed in placing orders with local agents instead of having to indent on the Stores Department. It would encourage firms in this country and local branches and agents for Home firms to keep stocks in the country and to bring samples of new or improved goods to the notice of possible buyers. One of the difficulties in this country is to keep up to date with modern fittings and appliances. At Home agents regularly lay all the improvements their firms bring out before people interested in the building trades, but in India there is at present very little inducement for them to do so.

(vii). *Whether the system of education in Government Engineering Colleges is organized on a sufficiently broad basis to meet the needs of private agency as well as of Government, whether it attracts suitable candidates, and whether the standard of instruction is sufficiently advanced to provide fully qualified civil engineers for employment by Government, local bodies, and private engineering and contracting firms, and, if not, in what directions and to what extent improvement is required.*

The Engineering Colleges in this Presidency are the following :—

- (1) College of Engineering, Poona.
- (2) Dayaram Jethmal Sind College in Karachi.

The College of Engineering at Poona is under the control of a Principal who is subordinate to the Director of Public Instruction. Selected students who have

APPENDIX II—continued.

studied for at least one year in an Arts College affiliated to the Bombay University are educated through the medium of the English language for the University degree of Bachelor of Engineering (Civil), and Bachelor of Engineering (Mechanical). A school for Engineering apprentices is attached to the College. There is a general course lasting for two years, and the third year men on passing the prescribed examination can join one of the three following classes:—

- (a) Sub-Overseer class.
- (b) Mechanical Engineer class.
- (c) Electrical Engineer class.

The number of students admitted to the College yearly at present is approximately:—

	From Bombay	From other Presidencies.
Civil Engineering course .	42	8
Mechanical Engineering course	8	2
Sub-Overseers course	about 32	about 8

Government at present guarantee the following appointments:—

- One Apprentice Engineer who becomes a Provincial Assistant Engineer after 1 year.
- Three Overseers.
- Three Sub-Overseers.

The three years University course leading to the degree of B. E. (Civil) will be found on pages 27 to 30 of the College Calendar and the so-called Sub-Overseer (Civil) course on pages 59 to 60.

An Advisory Committee for the College was appointed by the Bombay Government a few years ago whose functions are to advise Government on questions of policy, organization, staff, building equipment, the formation and reconstitution of classes, curriculum, etc., and also to take the initiative in suggesting improvements and reforms in respect of any of the above items. The Advisory Committee has on its board the Chief Engineer and Secretary to Government, Public Works Department, and other practical Engineers (officials and non-officials).

The course of studies, as laid down by the Bombay University, extends over three years, but while the general body of students present themselves for the final degree examination in the year succeeding that in which they pass the second year's examination, such of the students as wish to make their studies as thoroughly complete as possible, with a view to having a better chance for the guaranteed appointment of Assistant Engineer, invariably spend an additional year before they appear for the final examination on the results of which the selection for this appointment depends. The unsuccessful students have either to find private employment as Engineers or subordinates if they do not accept the guaranteed Overseer's post. Many of the next best men do accept these as they prefer Government posts to others even though they have to start on the lowest pay of the Upper Subordinate establishment.

Further information on the College course will be found in the memoranda prepared for the Public Services Commission which are incorporated in* this.

The Advisory Committee has drawn up a proposed four years' course which is now being considered by the Bombay University. A copy of this is attached as Annexure IV.* The extra time is mainly devoted to workshop practice and other practical work. There is a certain amount of revision in the lecture courses, but it is not intended to make them more difficult than at present. It is proposed to limit the number of admissions to this course as the number of openings for men with an Engineer's training in this Presidency and the surrounding States is not large. The limit will require to be expanded as circumstances necessitate

it. At present the majority of Graduates have to be content with Overseers' posts. It is hoped it will be possible to give better instruction to a small class of a dozen or so than to the present classes of fifty and over.

A copy of the proposed 3 years' diploma course for Overseers is also attached as Annexure V.* This contains more workshop practice and other practical work than the present B. E. course. It is thought that the men who have been through this course will be better Overseers than those who have gone through the present B. E. course.

The Sub-Overseers' course is not proposed to be altered. It has recently been revised.

2. The general opinion of officers of the Public Works Department is that the education imparted at the College of Engineering, Poona, is of a high order and is sufficient to turn out Civil Engineers capable of making their mark in the professional world. It has been stated the college laboratory is larger and better fitted out than the Engineering laboratory at Cambridge University.

The B. E. degree of the Bombay University is not yet recognised by the Institution of Civil Engineers as sufficient to exempt those holding it from passing the examination for Associate Membership. It is hoped that when the new four years' course is introduced that recognition will be accorded. It is understood that no Engineering College or University degree in India is as yet so recognised a fact which may be taken to indicate the standard of education in Engineering is not yet up to European requirements. The defect may be due to the lack of practical training, a subject which is dealt with later on.

3. The Dayaram Jethmal Sind College³ has an Engineering branch attached to the College, the full course of instruction in Civil and Mechanical Engineering extending over 3 years; the proficiency of the students is tested annually by examinations conducted by the Public Works Department and the certificates are granted on the results of these examinations, but it is not proposed at present to prepare students for the degree in Engineering of the University of Bombay. A special grant is made by Government in aid of these classes and four appointments, viz., 1 Overseer and 3 Sub-Overseers, in the Public Works Department are granted to students holding the full certificate.

The Chief Engineer in Sind remarks as follows about this College:—

"The Dayaram Jethmal Sind Arts College is the only institution in Sind which teaches Engineering and as the teachers are men of no particular professional standing it is quite impossible for them to turn out fully qualified engineers and architects. The direction and extent of improvement is obvious in this case."

4. For the lower paid posts the education imparted at the Poona College of Engineering is possibly on too broad a basis, and by men who will never rise beyond the grade of Overseer the time might be spent more profitably on practical engineering, such as levelling, survey, classification of materials, measuring work, simple specification work, and the like, instead of in cramming theoretical knowledge out of books which they are unable to apply in practice.

(viii). Whether adequate provision is made for the practical training on works of students who have received their scientific education in English or Indian Colleges.

The present position is best illustrated by a reference to correspondence noted below:—

The Government of India in their Department of Education letter No. 2226, dated 27th September 1912, stated that it seemed to them that the time had come to endeavour to connect educational institutions more closely with business firms, railways and other employers of labour to enquire how the former can better meet the requirements of the latter, and to point out the way to further employment of Indians in them. For this enquiry Colonel Atkinson and Mr. Dawson

* Not printed.

* Not printed.

were selected as having special practical experience on the subject.

The Government of India asked for the views of the local Governments on the recommendations contained in the report submitted by those officers. Amongst the general recommendations were the following :—

(1). That every student passing out of a civil engineering college should be given an apprenticeship for one year on practical work in the Public Works Department.

(2). That an inspecting and advisory officer should be appointed for all technical institutions in India and that an employment bureau should be established under his supervision and control.

(3). That the course of Civil Engineering at the Poona College of Engineering should include a term of apprenticeship under some competent officer.

(4). That the courses then prescribed at the College for the apprentice classes of Sub-Overseers, Mechanical Engineers and Electrical Engineers should be revised with a view to specialisation in the several branches at the earlier stage of the course.

(5). That the course of Mechanical and Electrical Engineering should include a term of two years' apprenticeship in works.

The views of the local Government were communicated to the Government of India in this Government Educational Department letter No. 1585, dated 27th May 1915. Paragraphs 6 to 10 inclusive of this letter relate to the Public Works Department training of Engineering students and are quoted below in full as they deal fully with this matter. The Government of India have not yet sent their reply.

"6. With regard to recommendation (1), the Governor in Council is of opinion that it would undoubtedly be conducive to efficiency if every student passing out of the College of Engineering at Poona could be given an apprenticeship for a year in the Public Works Department. From the narrower point of view of the immediate interests of that Department it may, it is true, be questioned whether it should be burdened with the task of training the considerable body of young men who annually complete their course of study at the College. These number about forty, and for the great majority of them permanent employment could not be found, so that they would necessarily leave to seek employment elsewhere and would thus cease to be of use to the Department. But against this it is necessary to take into account the wider considerations to which Colonel Atkinson and Mr. Dawson rightly give prominence. A large percentage of the men turned out from Indian engineering colleges obtain employment under municipalities, district boards, railways and contractors, but the excellent material thus obtained is often impaired in its efficiency through the want of that practical training which can be obtained only in the various branches of the Public Works Department and which, in existing conditions, is seldom or never given except in the case of men who have secured guaranteed appointments under Government. On this aspect of the case it may well be contended that the cost to Government of granting a year's apprenticeship in practical work to every man passed out of an engineering college would be amply repaid by the general benefit which such a measure would confer on the country at large professionally and financially. In nearly all cases the interests of the ultimate employer of every grade of civil engineer are closely related in some way or other to the interests of the State, and consequently the State will be a considerable gainer if the general standard of efficiency in the engineering profession is raised by means of a universal scheme of apprenticeship such as is contemplated.

7. While this more liberal view of the question cannot fail to commend itself on grounds of general policy and expediency, it has at the same time to be recognised that the proposal is open to certain practical difficulties.

Experience shows that Indian students, as soon as they terminate their college course, are actuated by one idea only, namely, that of placing themselves at the earliest possible opportunity in a position where they can earn a living, and, unless their certificates are withheld until they have served the desired term of apprenticeship, it is extremely doubtful whether a system of apprenticeships could successfully be imposed upon them to any general extent. The question arises accordingly whether, in the case of the students of the Poona College of Engineering who proceed to the B. E. degree of the Bombay University, that body would consent to withhold their certificates until they had passed a period of apprenticeship in the Public Works Department. The Governor in Council does not believe that the University would ever acquiesce in such a proposal inasmuch as it would have the effect of making the award of its B. E. degree dependent on the certificate of the Public Works Department and would therefore be regarded as an attempt to subordinate the University to a Government Department.

8. The advantages of a system of apprenticeship for civil engineer students are, however, so patent that, even admitting that it is not possible to apply it universally, it is worth while making the experiment of introducing it partially and on a voluntary basis. The officers of the Public Works Department who have been consulted consider that for ordinary engineering work a year's training would, in the first instance, be sufficient, and propose that a subsistence allowance of Rs. 30 per mensem, with travelling allowance for actual travelling, should be given to each student undergoing apprenticeship. The annual expenditure entailed in training 25 men on these terms is estimated at Rs. 15,000 or more according to the amount of travelling actually done by the apprentices. The system advocated by Colonel Atkinson and Mr. Dawson is the one in force for the training of apprentice overseers passing out of the Civil Engineering College at Roorkee. It is understood that at this institution a stipend of Rs. 40 per mensem is paid to each Indian apprentice, and that, where absolutely necessary, rent for quarters and an allowance for the upkeep of a horse are granted in addition. The travelling expenses incurred by the apprentices are also apparently paid by the College. A further feature of the Roorkee system is the payment of an honorarium to the Public Works Department officer under whom an apprentice is placed for practical instruction. If only in the interests of the apprentices, it appears undesirable that the work of training students should be added to the ordinary duties of the subordinate officers of the Public Works Department without some provision for the payment of extra remuneration, and it is accordingly proposed to adopt the rates of honorarium allowed in the case of Roorkee, viz., Re. 1 per diem for the first apprentice and eight annas each for any additional apprentices. The expenditure involved on this account would not exceed Rs. 9,000 per annum. The proposals of the officers of the Public Works Department, which follow generally the lines of the system in operation at Roorkee, commend themselves to the Governor in Council.

9. At the same time a scheme has been formulated for the practical training which is to be given to the apprentices on the works of the Public Works Department. It provides that they shall, as far as possible, be given both irrigation work and roads and building work, each kind of work occupying six months. During one or two months of the year of apprenticeship the students will also be required to devote some time to the work of management. Each apprentice will be required to submit at the end of every month to the Executive Engineer concerned, notes on the lines of those which were formerly required of the students at Coopers Hill College. Superintending Engineers will be expected to examine the apprentices occasionally in the following subjects :—

Construction (including nature of materials).

APPENDIX II—continued.

Management of labour with special regard to—

Supply of materials.

Actual construction.

Discipline.

Collecting labour.

Payment and accounts including—

Calling for contracts.

Piece-work.

Departmental work.

10. The scheme outlined above, which will in due course be worked out in greater detail, also follows generally the lines of the system in force at Roorkee, and the Governor in Council, on learning that it meets with the approval of the Government of India, will be prepared to bring it into force on a voluntary basis as soon as the financial situation admits. With regard to the question of its acceptability to civil engineering students, generally, I am to observe that appointing agencies are likely to prefer applicants for employment who have undergone a practical training to those who have had no such experience and that this consideration, combined with the proposed payment of subsistence and travelling allowances, may be expected to afford a fairly strong inducement to the students to take up the proposed course of apprenticeship, more especially if an announcement is made that only those who are so trained will in future be employed by Government."

ANNEXURE I.

Letter from H. F. Beale, Esq., M. Inst. C.E., Secretary to the Government of Bombay, Public Works Department, to the Secretary to the Government of India, Public Works Department, No. A-366, dated the 13th January 1914.

I am directed to reply to your letter No. 903 A. G., dated 3rd September 1912, on the subject of possible economies in the scale of expenditure on unremunerative public works, and to say that this question has frequently engaged the attention of the Government of Bombay. All projects submitted are carefully scrutinized as to the class of work and rates adopted, and a standard book of specifications (termed Marryat's) has been published, in which are described all the classes of work which may be used in this Presidency.

2. In Sind, mud masonry is used a good deal for the superstructure of buildings, but in the Presidency proper, it is mostly confined to buildings of a temporary nature. Everywhere efforts have been made to substitute some cheaper form of wood for Burma teak. At one time Jharrah looked promising, but that, like all the other woods, is very readily attacked by white ants. Yet, with the aid of preservatives, many of the cheaper woods have been brought into use in districts where they are readily obtainable. I am to say that no hope can be held out of further economies for the reasons detailed below.

3. So far from anticipating any reduction of rates, I am to show that it is far more probable that the rates will continue to rise. Able-bodied coolies are now receiving from 5 to 8 annas a day in places where 20 years ago they received from 3 to 5 annas; the rise in the cost of food and the facilities for travel, which enable them to repair to the most favourable market

for labour, are the causes for this increase. The competition for labour amongst employers is now very great in this Presidency. As the prosperity of the country increases, the demand for new works must continue to grow. At the present moment great activity prevails in the construction of dock works, railway extensions, electrical projects, large irrigation schemes, and many important buildings at the various large centres in this Presidency. Unless the prosperity of the country receives a serious set-back, there is no reason to anticipate any great reduction in this activity in the near future; but on the completion of these works, especially the irrigation schemes, great benefit will accrue to the working population, and the demand for a higher standard of living must necessarily follow.

4. A comparison has been made in Bombay and Ahmedabad between the rates paid for work and materials by the Public Works Department and by certain architects and mill-owners. There is little difference to be found in the figures reported, but it may be conceded that private persons can very frequently get work done more cheaply than Government, and there are several good reasons to account for this. In Government work the system of advances, which is universal with private employers, is objected to. Also Public Works Department Officers pay special attention to secure materials and work of the quality required, while many private employers care little about specifications and know nothing of the rules for sound construction. The better supervision referred to involves a charge for establishment. These are the main reasons for higher rates, but there are others, such as building in out of the way places, or when the market is unfavourable, etc.

5. In reference to the suggestion that a less durable and cheaper form of construction may be advisable for certain buildings, I am to say that the Government of Bombay has, as explained in paragraph 2 above, already adopted this principle as far as it is considered advisable. It has been ascertained that the repairs of *kutcha* buildings amount to 3 per cent. on their capital cost, and of *pucca* buildings to 1½ per cent. only. It follows that about 27 per cent. more may be spent on the latter in capital cost, and these buildings are more sanitary and satisfactory. White ants are the great enemy both of mud walls and cheap wood work, while in many places in Sind the creep of damp *kalar* is another objection to work of inferior quality.

6. The third query in your letter under reply is in connection with the possibility of reducing the superior establishment by extending charges of supervision. I am to state that this Government has already given its opinion that the Public Works Department in the Bombay Presidency is undermanned. A letter* was addressed to the Government of India asking for an increase in the cadre of permanent Engineers, because the proportion of temporary men on the establishment is considered too great. The answer of the Government of India was unfavourable, and the question is being studied again in the light of the remarks made by them in their Public Works Department letter No. 2309-E., dated the 31st October 1913. The Government of Bombay is now about to request the Government of India to sanction an increase of 54 men to the existing cadre of 249 Upper Subordinates. Hence it is evident that no reduction can be recommended as possible. With reference to the facilities for travelling brought about by the construction of good roads and railways I am to remark that the railways are seldom of any use to an Executive Engineer in his District, and that, without a motor vehicle, which only a few can afford to buy, the rate of travelling is not appreciably faster now than it was 10 or 15 years ago.

* No. E.—4418, dated 23rd April 1913.

APPENDIX II—continued.

ANNEXURE II(a).

Actual Expenditure incurred in Public Works Department from the year 1889-1890 to the year 1915-1916—Roads and Buildings Branch.

Year.	Imperial Military.	Imperial Civil.	Famine.	45—Civil Works Provincial.	Local.	Contribution.	Total gross Outlay on Works and Repairs Buildings and Roads.	Deduct Outlay on which Establishment Charges are not admissible.	Balance on which Establishment is charged.	Establishment Charges.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1889-90	10,77,528	1,35,961	....	26,73,172	8,11,077	4,32,735	51,30,473	8,24,953	48,05,520	11,93,989
1890-91	1,61,789	1,99,965	....	30,80,975	8,55,729	7,61,792	60,60,250	8,21,454	42,38,796	11,13,670
1891-92	1,77,908	2,42,480	....	30,37,688	10,56,158	7,68,331	52,61,525	6,83,509	45,78,016	11,32,260
1892-93	1,46,733	2,12,260	....	24,68,747	11,24,551	5,41,443	44,93,739	8,57,295	41,36,444	11,32,732
1893-94	1,49,562	3,36,828	....	23,55,933	10,70,246	3,19,141	42,31,710	2,98,408	39,33,302	11,54,486
1894-95	1,57,718	35,927	....	23,74,924	12,81,856	3,61,592	42,32,017	4,22,115	38,09,902	11,33,753
1895-96	1,83,862	1,80,392	....	24,32,428	13,16,511	6,78,370	47,91,564	6,42,022	41,49,542	11,40,371
1896-97	1,51,326	1,70,397	26,48,660	22,48,278	12,98,562	7,32,694	71,49,917	30,85,415	41,64,502	11,12,032
1897-98	2,30,101	1,06,210	58,84,957	18,14,106	9,89,204	6,30,423	96,55,001	63,26,043	33,28,958	9,91,283
1898-99	1,68,600	1,79,078	1,84,879	18,77,725	9,75,021	2,35,388	36,20,491	4,47,932	21,72,559	10,19,944
1899-1900	1,32,947	1,69,217	85,23,346	17,54,206	8,82,366	1,27,518	1,15,89,620	87,58,368	28,31,252	9,64,686
1900-01	1,18,827	2,02,630	1,79,25,857	18,48,097	7,30,678	2,62,484	2,10,91,573	1,83,52,049	27,39,524	9,37,222
1901-02	1,20,139	4,22,564	44,42,894	24,85,952	7,60,337	2,13,991	84,45,877	49,30,323	35,15,554	10,70,175
1902-03	1,16,070	2,65,004	21,47,383	32,57,419	18,85,950	1,17,756	67,89,582	67,89,582	0,00,496	10,95,999
	6,005	1,11,364	....	1,67,749	68,934	1,53,444	4,07,496	....	....	....
1903-04	1,45,622	2,66,613	....	33,05,300	9,75,216	2,83,732	49,76,483	4,60,599	49,76,483	11,37,825
	17,972	2,72,540	....	5,40,124	85,356	44,607	9,60,599	....	....	....
1904-05	1,32,317	2,49,564	19,006	32,99,862	10,14,168	1,97,915	49,12,922	6,65,531	49,12,922	11,97,576
	14,122	3,55,876	....	1,77,227	63,820	54,486	6,65,531	....	....	....
1905-06	71,219	4,04,572	97,426	29,11,765	13,50,859	2,68,955	51,04,796	7,83,766	51,04,796	12,64,869
	5,544	76,374	....	5,07,083	95,401	99,363	7,83,766	....	....	....
1906-07	69,652	5,78,809	4,82,364	45,79,167	11,19,474	3,59,755	71,87,241	9,35,851	71,87,241	13,49,569
	4,766	1,78,673	....	4,01,126	1,77,204	1,76,082	9,35,851	....	....	....
1907-08	65,825	7,91,915	3	61,60,416	15,61,072	2,74,922	88,54,153	7,92,844	80,61,309	13,59,300
1908-09	73,873	8,54,766	....	58,00,009	17,32,163	2,47,821	87,08,632	5,78,121	81,30,511	13,71,395
1909-10	60,119	8,25,814	....	54,84,843	19,96,190	2,65,975	86,38,941	7,82,256	78,52,685	14,51,671
1910-11	65,072	9,41,967	....	59,37,219	14,40,142	6,98,301	90,82,701	12,75,888	78,06,813	14,40,922
1911-12	65,855	8,03,736	4,44,680	64,19,730	16,99,096	12,37,966	1,06,71,063	24,47,060	82,24,003	12,39,277
1912-13	60,666	3,39,401	5,69,963	68,72,838	16,83,900	13,09,719	1,08,36,577	19,07,981	89,28,596	13,82,309
1913-14	67,112	7,18,513	147	85,95,411	15,88,339	13,93,737	1,23,53,259	21,97,242	1,01,60,017	14,97,764
1914-15	75,015	10,28,948	....	86,21,990	16,77,495	11,85,879	1,25,89,327	18,36,700	1,07,52,627	16,76,759
1915-16	55,166	8,97,846	....	54,32,012	17,23,357	17,36,482	98,44,863	17,47,750	80,97,113	18,20,317

ANNEXURE II(b).

Detail of Establishment Charges from the year 1889-1890 to 1915-1916.—Roads and Buildings Branch.

Year.	Imperial Military.	Imperial Civil.	Famine.	45—Civil Works Provincial.	Local.	Contribution.	Total as per Finance Accounts Buildings and Roads Branch.	Deduct Charges for Establishment specially engaged for any particular work.	Net Establishment Charges.	Direction.	Accounts.	Construction.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1889-90	2,38,251	26,263	....	8,40,807	92,068	26,840	12,32,729	39,840	11,93,889	1,79,675	1,25,616	8,68,098
1890-91	36,611	40,130	....	9,31,990	1,10,425	35,339	11,54,495	40,825	11,13,670	1,68,809	1,22,787	8,22,074
1891-92	40,975	50,268	....	9,09,820	1,30,092	44,232	11,75,387	43,027	11,32,360	1,64,726	1,29,744	8,37,300
1892-93	31,020	47,313	....	9,27,104	1,39,804	45,896	11,90,717	37,985	11,52,732	1,68,637	1,06,618	8,77,953
1893-94	33,928	52,368	....	9,42,853	1,27,587	31,601	11,88,357	33,871	11,54,486	1,81,325	1,02,208	8,70,953
1894-95	22,659	23,056	....	9,48,121	1,39,246	23,454	11,56,536	22,763	11,33,753	1,81,339	1,07,794	8,44,620
1895-96	35,369	36,082	....	9,06,962	1,47,064	42,342	11,67,819	27,448	11,40,371	1,86,288	1,14,163	8,39,920
1896-97	30,538	36,119	49,567	8,41,626	1,47,415	34,054	11,59,319	27,237	11,32,082	1,76,296	1,08,172	8,27,564
1897-98	29,054	21,552	1,74,183	8,38,048	96,892	22,825	10,53,577	1,91,871	9,61,283	1,62,721	1,12,137	7,16,425
1898-99	32,249	35,709	4,436	8,47,523	1,10,237	23,423	10,53,577	33,633	10,19,944	1,65,702	1,15,684	1,38,558
1899-1900	24,717	28,932	96,368	8,39,459	1,01,974	13,675	11,05,125	1,40,439	9,64,686	1,66,043	1,17,111	6,81,532
1900-01	22,665	34,724	3,92,921	8,34,789	86,036	6,154	13,77,289	4,40,066	9,37,223	1,77,350	1,14,022	6,48,851
1901-02	23,468	58,039	1,25,041	9,27,606	91,621	8,170	12,83,944	1,63,769	10,70,175	1,88,905	1,21,914	7,59,366
1902-03	27,143	66,015	34,415	9,27,576	1,06,650	5,949	11,97,748	64,172	10,95,999	1,86,261	1,22,457	7,87,291
1903-04	34,027	65,852	....	9,70,878	1,16,104	15,136	12,01,907	84,172	11,37,825	2,00,573	1,23,434	8,13,818
1904-05	31,628	66,327	752	10,40,122	1,23,064	10,750	12,72,643	75,067	11,97,574	2,19,135	1,24,575	8,53,866
1905-06	16,825	99,366	2,580	10,64,995	1,59,120	10,775	13,53,631	88,812	12,64,869	3,03,417	1,18,414	8,43,038
1906-07	10,586	1,30,127	30,567	11,37,656	1,34,100	19,141	14,74,183	1,24,814	13,49,569	3,21,064	1,13,859	9,14,846
1907-08	13,909	1,58,661	945	11,00,593	1,72,343	18,743	14,75,194	1,15,804	13,59,300	3,87,865	1,22,529	9,46,966
1908-09	15,458	1,83,182	574	11,26,965	1,70,035	13,168	15,09,384	1,37,959	13,71,385	3,18,774	1,30,374	9,22,247
1909-10	14,176	1,87,283	....	12,15,879	1,74,343	26,780	16,18,461	1,66,790	14,51,671	3,40,632	1,32,955	9,54,391
1910-11	14,331	1,50,125	....	12,82,599	1,40,856	47,600	16,35,713	1,94,791	14,40,922	3,50,922	1,32,955	9,58,723
1911-12	14,379	1,73,508	19,480	9,99,483	1,67,352	1,11,373	14,85,575	2,46,298	12,39,277	3,22,291	....	9,16,966
1912-13	12,993	80,875	56,724	12,68,543	1,48,639	99,155	16,66,929	2,84,620	13,82,309	3,50,922	....	10,25,987
1913-14	13,201	1,44,739	81	14,78,395	1,52,829	24,968	18,14,231	3,16,467	14,97,764	3,63,626	....	11,33,938
1914-15	15,683	1,90,736	....	14,86,168	1,66,331	90,100	19,51,018	2,74,259	16,76,759	3,50,911	....	13,25,644
1915-16	11,051	1,60,772	....	15,77,060	1,55,127	73,913	19,77,923	1,57,606	18,20,317	3,54,367	....	14,65,950

APPENDIX II—continued.

ANNEXURE II(c).

Statement of expenditure on Famine Relief Works.

Year.	Famine Relief Works carried out by the Roads and Buildings Branch.	Famine Relief Works carried out by the Irrigation Branch.	Actual Roads and Buildings, Famine Establishment charges from finance accounts.
	Rs.	Rs.	Rs.
1896-97	26,59,222	85,781	49,567
1897-98	46,78,948	12,06,009	1,53,203
1898-99	18,794	1,65,886	3,398
1899-1900	62,36,686	22,86,660	77,553
1900-01	1,20,39,505	58,89,352	3,23,837
1901-02	20,44,610	23,98,284	83,341
1902-03	1,97,788	20,45,800	62,650
1903-04	..	..	..
1904-05	..	24,660	..
1905-06	57,463	41,311	886
1906-07	2,90,931	1,96,120	24,267
1907-08	..	..	945
1908-09	..	..	574
1909-10	..	..	..
1910-11	..	..	..
1911-12	1,46,901	2,97,779	19,480
1912-13	1,04,812	4,65,151	43,175
1913-14	..	..	81
1914-15	..	..	..
1915-16	..	..	..

ANNEXURE II(d).

ROADS AND BUILDINGS BRANCH.

Public Works Department.

Establishment Percentages.

Year.	Net cost of works on which Establishment is charged. (This does not include famine outlay.)	Cost of famine work carried out by Roads and Buildings Branch only.	Total of columns 2 and 3.	Net Establishment charges.	Establishment charges incurred on Roads and Buildings Famine Works only.	Total of columns 5 and 6.	Total of columns 4 and 7 = total cost of work including Establishment.	A Percentage column 7 on column 4.	B Percentage column 7 on column 6.	Establishment construction charges only plus Famine Establishment charges vide column 6.	Column 4 plus column 11.	C Percentage column 11 on column 4.	D Percentage column 11 on column 4 plus column 11, i.e., column 12.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.			Rs.	Rs.		
1899-00	49,05,520	..	49,05,520	11,93,389	..	11,93,389	50,98,909	24.8	19.0	8,88,098	56.93	18.5	15.6
1899-01	42,38,796	..	42,38,796	11,13,670	..	11,13,670	53,52,466	26.4	20.8	8,22,074	50.60	19.4	16.2
1899-02	45,78,016	..	45,78,016	11,32,360	..	11,32,360	57,10,376	24.7	19.9	8,37,890	54.16	18.3	15.4
1899-03	41,36,444	..	41,36,444	11,52,732	..	11,52,732	52,89,176	27.9	21.8	8,77,417	50.14	21.2	17.5
1899-04	39,33,302	..	39,33,302	11,54,486	..	11,54,486	50,87,788	29.4	22.7	8,70,953	48.04	22.2	18.1
1899-05	38,09,902	..	38,09,902	11,33,753	..	11,33,753	49,43,655	29.8	23.0	8,44,620	46.54	22.2	18.1
1899-06	41,49,542	..	41,49,542	11,40,371	..	11,40,371	52,89,913	27.5	21.6	8,39,920	49.99	20.2	16.8
1899-07	41,64,502	26,58,222	68,22,724	11,12,932	49,567	11,61,608	79,84,332	17.0	14.5	8,77,131	77.00	12.8	11.4
1899-08	33,28,958	46,78,948	80,07,906	9,91,283	1,53,203	11,44,486	91,52,392	14.3	12.5	8,69,628	88.77	10.8	9.8
1899-09	31,72,559	18,794	31,91,353	10,19,944	3,338	10,23,282	42,14,635	32.1	24.3	7,41,896	39.33	23.2	18.9
1899-1900	28,31,252	62,36,686	90,67,938	9,64,686	77,558	10,42,249	1,01,10,177	11.5	10.3	7,59,085	98.27	8.4	7.7
1900-01	27,39,524	1,20,39,505	1,47,79,029	9,37,223	3,23,837	12,61,060	1,60,40,089	8.6	7.8	9,69,688	1,67.49	6.6	6.1
1901-02	35,15,554	20,44,610	55,60,164	10,70,175	93,341	11,59,516	67,18,680	20.8	17.2	8,42,697	64.03	15.1	13.1
1902-03	67,89,582	1,97,788	69,87,370	10,95,999	62,650	11,58,649	81,46,019	16.6	14.2	8,49,931	78.37	12.2	10.9
1903-04	49,78,483	..	49,78,483	11,37,625	..	11,37,625	61,14,308	22.8	18.6	8,13,818	57.90	16.4	14.1
1904-05	49,12,922	..	49,12,922	11,97,576	..	11,97,576	41,10,498	24.4	19.6	8,53,866	57.67	17.4	14.3
1905-06	51,04,796	57,463	51,62,259	12,64,869	896	12,65,755	64,28,014	24.5	19.7	8,43,924	60.06	16.3	13.9
1906-07	71,87,241	2,90,931	74,78,172	13,49,569	24,267	13,73,836	88,52,008	18.4	15.5	9,36,913	84.17	12.6	11.1
1907-08	80,61,309	..	80,61,309	13,59,300	945	13,60,245	94,21,554	16.9	14.4	9,49,951	90.11	11.8	10.5
1908-09	81,30,511	..	81,30,511	13,71,395	574	13,71,969	95,02,480	16.9	14.4	9,22,221	90.53	11.3	10.2
1909-10	78,52,685	..	78,52,685	14,51,671	..	14,51,671	93,04,356	15.5	13.6	9,54,391	88.07	12.1	11.8
1910-11	78,06,813	..	78,06,813	14,40,922	..	14,40,922	92,47,735	15.5	13.6	9,58,723	87.06	12.3	10.9
1911-12	82,24,003	1,46,901	83,70,904	12,39,277	19,480	12,58,757	96,29,661	15.0	13.1	9,36,466	93.07	11.2	10.1
1912-13	89,28,596	1,04,812	90,33,408	13,82,309	43,175	14,25,484	1,04,58,892	15.8	13.7	10,69,162	1,01.03	11.8	10.6
1913-14	1,01,60,017	..	1,01,60,017	14,97,764	81	14,97,845	1,16,57,862	14.7	12.8	11,34,019	1,12.94	10.2	10.0
1914-15	1,07,52,627	..	1,07,52,627	16,76,759	..	16,76,759	1,24,29,386	15.6	13.5	13,26,848	1,20.78	12.3	11.0
1915-16	80,97,113	..	80,97,113	18,20,317	..	18,20,317	99,17,430	23.5	18.3	14,65,950	95.63	18.1	15.3

APPENDIX II—continued.

ANNEXURE II(e).*

Statement showing percentages of establishment charges on total value of works including irrigation executed by the Bombay Public Works Department.

Year.	NET TOTAL OUTLAY ON WORKS.			NET TOTAL ESTABLISHMENT CHARGES INCLUDING DIRECTION AND ACCOUNTS.			PERCENTAGE AND ESTABLISHMENT TO WORKS.	
	Buildings and Roads Branch.	Irrigation Branch.	Total.	Buildings and Roads Branch.	Irrigation Branch.	Total.	Percentage of column 7 on column 4.	Percentage of column 7 to column 4+7.
1	2	3	4	5	6	7	8	9
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		
1889-90	48,05,520	20,97,812	69,03,332	11,93,389	6,01,378	17,94,767	26.0	20.6
1890-91	42,38,796	20,37,415	62,76,211	11,18,670	5,92,365	17,06,035	27.1	21.3
1891-92	45,78,016	17,14,736	62,92,752	11,32,360	5,16,210	16,47,570	26.1	20.7
1892-93	41,36,444	18,02,617	59,39,061	11,52,732	5,48,654	17,01,386	28.6	22.2
1893-94	39,33,302	22,62,652	61,95,954	11,54,486	6,38,429	17,92,915	28.9	22.4
1894-95	38,09,902	26,01,345	64,11,247	11,33,753	7,91,090	19,24,843	30.0	23.0
1895-96	41,49,542	28,74,463	70,24,005	11,40,371	7,85,539	19,25,910	27.4	21.5
1896-97	41,84,502	35,10,708	76,95,210	11,12,032	8,42,811	19,54,843	25.4	20.3
1897-98	33,28,958	33,63,260	66,92,218	9,91,283	8,53,535	18,44,818	27.5	21.6
1898-99	31,72,559	31,55,712	63,28,271	10,19,944	8,36,827	18,56,771	29.3	22.6
1899-1900	28,31,252	35,79,836	64,11,088	9,64,686	9,02,206	18,66,892	29.1	22.5
1900-01	31,72,559	40,73,309	68,12,833	9,37,223	10,09,825	19,47,048	28.5	22.2
1901-02	35,15,554	35,47,151	70,62,705	10,70,175	9,60,435	20,30,610	29.7	22.3
1902-03	27,39,524	40,73,309	68,12,833	10,95,999	9,38,712	20,34,711	17.9	15.2
1903-04	49,76,483	36,41,740	86,18,223	11,37,825	9,24,141	20,61,966	23.9	19.3
1904-05	49,12,922	34,69,450	83,82,372	11,97,576	9,83,617	21,81,193	26.0	20.6
1905-06	51,04,796	31,84,334	82,89,130	12,64,869	9,70,659	22,35,528	26.9	21.2
1906-07	71,87,241	31,16,638	1,03,03,879	13,48,569	10,06,952	23,56,521	23.8	18.5
1907-08	80,61,309	38,88,530	1,19,49,839	13,59,300	10,02,190	23,61,490	19.7	16.5
1908-09	81,30,511	42,96,891	1,24,27,402	13,71,895	11,52,454	25,24,349	20.3	16.8
1909-10	78,52,885	50,74,707	1,29,27,592	14,51,671	12,13,018	26,64,689	20.6	17.1
1910-11	78,06,813	48,64,295	1,26,71,108	14,40,922	12,63,569	27,04,491	21.3	17.6
1911-12	82,24,009	51,01,118	1,33,25,127	12,39,277	12,88,479	25,27,756	18.9	15.9
1912-13	89,28,598	54,00,622	1,43,29,220	13,82,309	13,65,229	27,47,538	19.1	16.1
1913-14	1,01,60,617	68,04,677	1,69,65,294	14,97,764	15,35,245	30,33,009	17.8	15.1
1914-15	1,07,52,627	72,83,959	1,80,36,586	16,76,759	15,37,865	32,14,624	17.8	15.1
1915-16	80,97,113	64,05,111	1,45,02,224	18,20,317	16,09,149	34,29,466	23.6	19.1

* Annexures II (f) and (g) not printed.

ANNEXURE III.†

Powers of administrative sanction in connection with Provincial Major and Minor Works up to the amounts mentioned against each.

Designation of officer.	Provincial Minor Works in connection with residential buildings, the total capital cost of which with the additions and alterations does not exceed the limits below and other than those connected with Government Houses and Ecclesiastical Buildings.	Provincial Works other than residential buildings and those in connection with Government Houses and Ecclesiastical Buildings.
	Rs.	Rs.
Commissioner in Sind	Rs. 2,000, and as regards Police Sub-Inspectors' quarters as per Government Resolution No. C. W.—240, dated 11th January 1913.	10,000
Commissioners of Divisions	Rs. 2,000	10,000
Commissioner of Customs, Salt, Opium and Abkari	" 2,000	10,000
Director of Agriculture	" 2,000	10,000
Settlement Commissioner and Director of Land Records	" 2,000	10,000
Inspector-General of Registration	" 2,000	10,000
Commissioner of Income Tax, Bombay	" 2,000	10,000
Superintendent of Stamps, Bombay	" 2,000	10,000
Collector of Bombay	" 2,000	10,000
Surgeon-General with the Government of Bombay	" 2,000	10,000
Director of Public Instruction	" 2,000	10,000
Inspector-General of Police	Rs. 2,000, and as regards Police Sub-Inspectors' quarters as per Government Resolution No. C. W.—4564, dated 26th April 1913.	10,000
Commissioner of Police, Bombay	Rs. 2,000	10,000
Inspector-General of Prisons	" 2,000	10,000
Agent to the Governor, Kathiawar	N/2	5,000
Political Resident, Aden	N/2	5,000
Chief Engineer in Sind	Rs. 2,000	10,000
Superintending Engineers of Divisions	" 2,000	10,000
Sanitary Engineer to Government	" 2,000	10,000
Executive Engineers	N/2	2,500

† Annexures (IV) and (V) not printed.

APPENDIX II—concluded.

ANNEXURE III—concluded.

Powers of certain Superintending Engineers to sanction estimates for works and to accept tenders.

Officers.	Power to sanction Engineering details of works.	Power to accept tenders.
	Rs.	Rs.
Mr. Ali Akbar, M. Inst. C.E., Superintending Engineer	50,000	50,000
Mr. F. St. J. Gebbie, Superintending Engineer, Indus Right Bank Division	20,000	20,000
Mr. F. Wright, Superintending Engineer, Southern Division	20,000	20,000
Mr. R. J. Kent, Assoc. M. Inst. C.E., Superintending Engineer, Central Division	20,000	20,000
Major F. M. Westropp, R.E., Superintending Engineer	20,000	20,000

APPENDIX III.

Note by the Hon'ble the Chief Commissioner of the Central Provinces.

In the note below I shall record my general opinion on certain of the matters referred to the Committee. I regret that I have had no time to work up the subject in the way that I should have liked, as I have been very busy and the reports of the officers who have been consulted reached me only a day or two ago.

2. In the Central Provinces we have, besides the Public Works organisation, a Divisional Local Fund Engineer establishment for carrying out work for local bodies. There are thus two agencies existing side by side, and a considerable body of opinion exists that this is uneconomical and should not be continued. This forms the chief question of reorganisation for decision in this Province, for it is admitted on all sides that considering local conditions there can be practically no change in existing *methods* of work and that no system of private enterprise can take the place of departmental agency for many years to come. On the latter point evidence will be given by the officers of Government who will be examined by the Committee, and I need not enlarge on the subject here, beyond saying that any attempts that have been made in the past to employ local men as large contractors for important public works have proved a failure. Instances in point are the new Secretariat and the Post Office at Nagpur and in the Irrigation Branch the Ramtek and Tendula Canal Head-works. Contracting firms in Calcutta and Bombay might no doubt be employed, but the general conclusion is that the rates of the Public Works Department are not a sufficient inducement to them to undertake works in these Provinces. I am at present considering the question of giving some building work in connection with schools to Messrs. ———, the engineers who are carrying out the ——— Works, but the matter has not yet got beyond the suggestion stage. This experiment, which would be made by the employment of an agency of standing and professional capacity, may show that with existing rates large contractors will come forward to undertake our works. But the agency will be from outside the Province; in view of past experience we can hardly expect to obtain indigenous agency of a quality that will enable any saving to be made in the way of reduction of supervision and management of works.

3. The contractors at present employed are for the most part small men; they are mere suppliers of labour and to some extent of materials. The only labour they can obtain is generally inefficient and the materials they supply require the closest supervision. I believe that, as a matter of fact, our petty contractors make little more than a bare living; many of them have to work on borrowed money, and the question was raised some time ago of introducing a system of Government advances to approved men, so as to get contractors to come forward more readily and do better work. The idea, was, however, given up as impracticable.

4. If it is accepted that our existing system must remain, we have to face the fact that a strong supervising agency is necessary, and this being so it can scarcely be said that present *methods* are uneconomical or unsuitable. One frequently hears the view expressed that the Public Works Department is extravagant, and I shall below give some reasons which tend to produce this impression, for which there is something to be said. But the methods of working can hardly be gainsaid, as there is nothing else to replace them.

5. As regards the Public Works Department organisation criticism is possible in respect of the following matters:—

(a). The service is not in such close touch with the general administrative officers, Commissioners and Deputy Commissioners, as are practically all the other departmental services. It is a specialist department, which goes on its own lines and is not responsive to criticism. I quote the following remarks made on this point in replies which have been received:—

Mr. Marten, Deputy Commissioner, Saugor:—

“As we cannot have the system in force in England of employing private firms we must have a Public Works Department and, admitting the great value of the work done by the present Public Works Department, there are certain defects which are, I think, patent. The Public Works Department originated as a body of expert Engineers employed to execute works required for the various branches of the Civil Administration. It has developed into an enormous departmental organisation running on parallel lines with the Civil Department, in many respects entirely independent and with a large power of control and allotment of funds. Though a parallel organisation the various charges do not coincide with the Civil charges and many districts have no resident Executive Engineer but are only visiting charges. This fact combined with a highly developed departmental spirit and a feeling of exclusiveness, which is perhaps natural in the expert in respect of technical work, tends to create an impression that the department is not responsive to criticism or even readily receptive of suggestion by the layman. However much the Deputy Commissioner may be interested in the Civil works of his district, the state of the roads, the progress of buildings, etc., he has, I think, a feeling that they are beyond his reach and outside his jurisdiction, as indeed they are, inasmuch as he has no direct control over them. He feels that only by protracted and perhaps acrimonious correspondence through devious channels can he make his opinions felt or bring home his criticisms, and that even then there is little chance of enforcing individual responsibility in respect of matters which may have been dealt with by numerous individuals and are susceptible of endless technical explanations. I mention these

APPENDIX III—continued.

matters not in a bitter spirit but because I believe that they illustrate what is the principal defect of the Public Works Department in over departmentalisation, too much internal organisation and too little control from without, resulting in want of individual responsibility, too much sticking to a groove and want of close sympathy with the departments directly concerned with the works being executed."

Mr. Wills, Deputy Commissioner, Betul :—

"The Public Works Department is in district administration somewhat of an *"imperium in imperio."* It is largely independent of control by District officers and is correspondingly indifferent to their criticism."

I believe that this aloofness from the general administrative machine and independence of outside control and criticism is largely responsible for what I consider to be the case, *viz.*, that the Department as a whole is not up to the standard in point of view of all-round efficiency of other branches of the public service in India.

(b). I notice amongst some of the opinions sent in by Public Works Department officers themselves recognition that the personnel of the Department is not up to the mark. Mr. Thomson mentions the prevalence of inefficiency in the ranks of the Public Works Department. He speaks of the young Assistant Engineer who, finding himself relegated to measuring up stacks of metal and paying *coolies*, loses interest in his profession and adopts an attitude of carrying on to the detriment of his efficiency and capacity for higher posts. He further condemns the incremental system of promotion as being a narcotic which tends to kill competition and encourages a spirit of minimum effort. My personal opinion, as already stated, is that the Department has more bad bargains than should be the case. There is not the keenness amongst many men to make the best job of their work. There is a tendency to get into a groove and carry on. The way in which road-side trees will be planted and provided with tree-guards according to the book and then left to live or die, is an instance in point: on many roads in this Province money has been thrown away time and again through slackness in this particular. I shall not enlarge on the subject further, but I feel bound to state that all is not well in the Department.

(c). The subordinate establishment is frequently of poor quality and has not got the best of reputations for honesty. It may almost certainly be said that this touches the difficulty which is frequently experienced in getting contractors, a point that is often brought forward. If the contractor has to pay commission, he must make it good somehow, and scamped work is inevitable.

(d). The Public Works Department is blamed for its fondness for the "solid and substantial" in the matter of construction. This is not a defect in organisation, and the Department can say that it is for the officers giving administrative sanction to works to object. But it is probable that closer touch with the general administrative side would make it easier for such objection to be taken and would result in a partial measure of economy in this respect.

(e). Departmental criticism of the organisation of the Department raises the question of the unsuitability of many of the provisions of the Code—a view for which I understand there is much foundation—and the further question of far too much of the time of the professional agency being occupied with accounts. I believe there is a great deal in this latter criticism and it is a matter which deserves investigation. I would add my further opinion that there is too much writing work in the offices of Executive Engineers and their subordinates. In cases which have come before me I have noticed the use of formal correspondence about matters of the most trifling detail. I have tried to drop on this, but I believe the evil is still very pronounced. In a slackly run office the Babu always gets the upper hand and makes work for more clerks and still more. A thorough purge is wanted here.

6. I have referred to these criticisms which are generally made regarding the Department, as they certainly affect the *economy* of the Department although they hardly affect the *methods* of carrying out works except indirectly. It must be understood that I do not condemn every individual man in the Engineer service nor every individual subordinate employé. There are excellent men in the Public Works Department, but there are more than there should be who are indifferent bargainers to the State, and there is not always manifest that keenness to get the best out of the money that is spent that one would like to see.

7. There is a further question which bears on economy, *viz.*, that of the high rates of pay drawn by officers of the Imperial Service for doing the ordinary work of a Public Works Department division. This is a matter which I can best refer to when I come to make suggestions for a different organisation for the carrying out of ordinary works.

8. Side by side with the Public Works Department we have in these Provinces what is known as the Divisional Local Fund Engineer scheme for doing the work of local bodies. A separate note is being prepared dealing with this scheme, and witnesses will also speak regarding it. The District Councils of the Central Provinces (I exclude for the present Berar) are too poor to maintain a suitable establishment for their own works; and certain Provincial works have been transferred to the Divisional Local Fund Engineer, on which Government pays to the District* Councils the usual supervision charges, in order that with the help of the latter the Councils may be able to finance the scheme. In Berar the District Boards have hitherto run an arrangement of this kind from their own resources. Recently approval has been given to the appointment of two Local Fund Engineers for Berar, and it is being suggested that certain Government works should be made over to them partly to provide funds for the two posts and partly as, on account of the depletion of the Public Works Department cadre because of the war, the Public Works Department Executive Engineers in Berar are overburdened with work.

9. In the Central Provinces the arrangement has not been successful. The charge of a Divisional Local Fund Engineer—a Commissioner's division—is too large for one man; the District Councils have inefficient subordinate staffs—they cannot afford to pay for better—and too much devolves on the Local Fund Engineer: the latter has really the position and responsibilities of an Executive Engineer and cannot undertake them. In Berar the District Boards have fairly well-paid Supervisors, who are really the Executive Engineers of the districts, and the Local Fund Engineer is more a Superintending Engineer. The Commissioner of Berar is satisfied with this arrangement; he thinks it is on the whole working well and holds out the prospect of considerable expansion on existing lines. The general conclusion may be stated that in the Central Provinces we must adopt a similar arrangement and abandon the scheme on the lines which are at present followed, *i.e.*, the Divisional Local Fund Engineer should be an inspecting, and not an executive agency, and a well-paid Supervisor must be appointed in each district for the execution of works. This, however, involves heavy subsidies being paid from Government revenues to the District Councils and the transfer of more works. The District Councils are in most districts very badly off and their programme of works is a limited one.

10. The Divisional Local Fund Engineer is not under the District Councils in either the Central Provinces or Berar, but under the Commissioner. The position with regard to his staff, district supervisors and sub-overseers, in the Central Provinces is somewhat anomalous. The District Councils regard them as their own servants, but the staff take their orders from the Local Fund Engineer and are really outside the control of the Councils. In Berar the supervisors and sub-overseers are under

* Note.—In the Central Provinces we have District Councils. In Berar District Boards.

APPENDIX III—continued.

the District Boards. Mr. Walker, Commissioner of the Nerbudda Division, will explain the position in the Central Provinces more fully to the Committee and will also tell how the present position has arisen and what has been the past history of the execution of District Council works.

11. The main question which we have to deal with is, as I have stated at the beginning of this note, whether we should have two separate agencies for the execution of works in the districts, viz.:—

(1). The regular Public Works Department establishment.

(2). The so-called Divisional Local Fund Engineer establishment (based on the Berar model, which it will be necessary to adopt, if the system is to be continued). The system I would advocate is that we should employ only one agency and have a staff of District Engineers, to do the ordinary work both of Government and of the local bodies. Mr. Walker in his note has strongly pressed for this change and the same conclusion has been arrived at by Mr. Thomson, Superintending Engineer.

12. The main reason for the change is that it is the most economical that can be devised. The present arrangement is wasteful, more especially in the Central Provinces where District Councils have not enough work to provide an adequate staff and where over-lapping results. The other day at the headquarters of a *tahsil* I found a Public Works Department Sub-Overseer and a Local Fund Sub-Overseer, both posted to the same place, and both doing work which constantly crossed. Again it cannot be denied that much of the work in an ordinary Public Works Department division does not require a highly paid man to look after it. We find men drawing Rs. 1,250 a month in charge of works which could be quite efficiently run by a man on half the pay or even less. There is extravagance in this respect in the present organisation of the Public Works Department.

13. If a system of District Engineers is adopted, the service should be akin to the present Public Works Department Provincial Service. It might be entirely recruited in India, where, by the time it is fully brought into force even if there is not at present, there will be ample material for the purpose. The Public Works Department service proper would then consist of a few superior and specialist posts under a Chief Engineer on the lines put forward by Mr. Thomson. In the Central Provinces for some time to come there are some districts which would not give sufficient work—Government and District Council combined—for one Engineer; in such cases it would be necessary to create an independent sub-division under an Assistant Engineer. It would also not be necessary to have a Superintending Engineer for each Commissioner's Division as Mr. Thomson suggests two for the Central Provinces and one for Berar would suffice.

14. The Superintending Engineers of this service would be associated with the Commissioner of the Division administratively, and the Executive Engineer with the Deputy Commissioner of the district. I hold that by bringing the Public Works service thus into direct touch with the administrative side, there would be much advantage to be gained; I need only refer to my remarks on this subject in paragraph 5(a) and (b) above. There would also be a check on the tendency to make works too expensive for the purpose they have to serve, see paragraph 5(d). Professionally the control would rest with the Chief Engineer as at present, as the service would be a Government service, but administratively the Superintending Engineers and Executive Engineers would be the co-adjutors of Commissioners and Deputy Commissioners, as is the case in other branches of the public service, where this light and elastic form of subordination works exceedingly well and without friction.

15. The one great practical obstacle to the adoption of this plan is that District Councils and Boards would cease to be responsible for the carrying out of their own works. They would merely propose schemes and provide money—paying their share of the expenses of the establishment either by a direct contribution or by a system

of regulated supervision charges, and there their function would practically cease. In the Central Provinces District Councils have never been invested with powers to carry out works, except of a petty nature, so that historically they can make no claim that their powers are being interfered with. But in practice the Councils have come to consider themselves masters of the staffs they entertain and pay for, and this is one of the complaints made against the Divisional Local Fund Engineer scheme, viz., that it derogates from their powers. And when so much is being said and written about the advancement of local self-government, there is hardly a doubt that the proposal to put the work of the Councils under a Government District Engineer will not be well received. In Berar, there will be a distinct breach with existing practice in this respect, where the District Boards have control over their works staff the Divisional Local Fund Engineer being merely an inspecting officer, with power to prepare or pass estimates professionally.

16. In my opinion we can hardly expect a proposal such as has been made to be carried through unless we provide some way of connecting local bodies with the scheme. Mr. Standen, the Commissioner of Berar, whom I have consulted would hold out for the existing Berar system of two separate agencies, side by side; and in the circumstances of Berar there is room for these two agencies, although one of them, the Public Works Department, can perhaps be considered over-expensive. But we should, if possible, have a uniform scheme, and the District Engineer proposal should hold the field. The suggestion I have to make is that there should be a district "board of works" of which the Deputy Commissioner would be the chairman and to which there would be appointed, say two members to represent District Councils or Boards and two to represent municipalities. The "board of works" could find work to do in the way of advising on road schemes, on the provision which is advisable for the proper upkeep of roads, on standard designs for buildings and the like. I think that in this way a place might be found for such a board in the district administrative machine. We should have to make it clear to local bodies that the District Engineer scheme is put forward on grounds of all-round economy if the service is recruited in India, this will be an additional palliative—that it must, to be efficient, be subject to single control, and that by means of the "works board" the District Councils will be able to bring forward their views and give expression to their opinions in the actual running of the scheme.

17. I put forward this proposal as one which I believe to be both practical and economical. The only objection is that we are taking a backward step in the way of excluding the people from the management of their own affairs, whereas we should endeavour to bring them on and educate them in this respect. In practice it is well known that in connection with a practical matter such as the execution of works a body like a District Council is beset with difficulties; in its corporate capacity it cannot take prompt action and deal with every day problems in a business-like manner. The Commissioner of Berar admits that the system of carrying out works there is rendered possible only because at each district headquarters there is a vice-chairman, generally a pleader, who disposes of the work of the Board with comparative expedition. Why not bring this representative of the local body on the suggested "board of works"? It may not be altogether the same thing in theory; but in practice it gives the District Board recognition. And with this, for the sake of economy and expedition in the carrying out of its works, the local body would have to be content.

18. It may be also that, as time goes on, the District Engineer organisation may be placed exclusively under the District Boards. This is a development which cannot be thought of for many years to come, but it is a possible evolution.

19. The above is the main practical suggestion which I have to lay before the Committee. If it is considered

that action is possible on these lines, it hardly seems necessary to go into the whole of the points which the Committee have to consider, and which affect mainly the working of the Public Works Department as at present organised. I have said that the present organisation is unsatisfactory in certain respects, it is too centralised and it is too expensive for the greater part of the work it has to do. Let us look for a system which will be as free as possible of these defects, let there be more decentralisation and let us try to have better business methods in the office and accounts work of the engineers. On these lines, and not by an attempt entirely to change the methods of actual execution of works—a change of which there is no possibility in these Provinces at the present time—appears to me to lie the way to reform.

20. If the proposal above put forward should find acceptance, I would advocate that there should no longer be a separate Public Works Department Secretary to the Local Administration, at any rate in connection with Roads and Buildings. The Chief Engineer should remain the professional and departmental head of the service, but the Secretaryship should be combined with that of the Local and Municipal Department. There should be no departure in this respect from the system which is followed with regard to other departments of the administration. The Head of a Province requires as a Secretary a man with a talent for this partic-

ular kind of work. It is not to be expected that he will find it in every Chief Engineer; a good man professionally may be a very indifferent Secretary indeed. Further it is of advantage to have the questions which are submitted for the orders of the Government examined independently of the head of the department who puts them forward. The head of the department will be called into counsel, as is the custom followed at present with other departments, when a matter comes up on which further advice is required or in regard to which there is a division of opinion. A member of the Public Works Department should be eligible for appointment as Secretary to Government for the branch of the administration in which Public Works are included in the Secretariat. If, as I have suggested, the Secretaryship for Local and Municipal affairs is combined with Public Works, an Engineer under the scheme already set forth would have sufficient experience of dealings with District Councils and Municipalities to make a reasonably efficient Secretary, if he were otherwise suited for the post.

21. One other matter I should like to mention and that is the difficulty created by the financial year ending in April the middle of the working season. So far as concerns the Public Works, the date is about the worst that could be chosen. It may not be possible to effect any alteration, but if a change is ever to be made the Public Works point of view should be strongly pressed.

APPENDIX IV.

Memorandum prepared by the Administration of the Central Provinces.

The Public Works Department in the Central Provinces is divided into two branches, namely, Irrigation and Roads and Buildings. The Superior staff of both branches is on a combined cadre, but although in the earlier years of the existence of the Irrigation Department, which was only organized in 1902, transfers from the Roads and Buildings Branch to the Irrigation Branch were frequent as the latter developed such transfers are now exceptional, and the intention is to keep the staff of the two branches completely separate so far as is practicable.

2. The Roads and Buildings Branch is administered by a Chief Engineer who is also Secretary to the Local Administration, and two Superintending Engineers with headquarters at Nagpur and Jubbulpore, respectively. Other administrative posts are that of Under Secretary to the Administration and that of Assistant Secretary, the former being held by an Executive Engineer and the latter by an officer usually promoted from the subordinate clerical establishment. At the beginning of the current financial year the total number of divisional charges was 11, of which 1 has since been held in abeyance, due to causes connected with the war. (In addition to the above there were in the previous year 2 temporary Divisions which were closed on account of the war.) The number of Sub-divisional charges was 44. Of the Divisional charges, 7 were held by Imperial Engineers, and 4 by Provincial Engineers. Of the Sub-divisional charges, 3 were held by Imperial Engineers, 5 by Provincial Engineers, 4 by Temporary Engineers, 28 by Upper Subordinates and 4 by Lower Subordinates.

3. In addition to the above, the following specialist appointments have been sanctioned:—

- (a). Sanitary Engineer.
- (b). Electrical Inspector, and
- (c). Assistant Architect.

The appointment of Sanitary Engineer is equivalent to that of a Superintending Engineer, and it has hitherto been filled by an officer of the Roads and Buildings or Irrigation Branch; the question of obtaining an officer with special qualifications for the post will have to be considered after the war. The Sanitary Engineer pre-

pares Water-works and Drainage Projects for various Municipalities and supervises their construction which, as a rule, is carried out by the Executive Engineers of the Roads and Buildings Branch in addition to their ordinary work, though in certain cases special Sub-Divisions have been opened. A few of the more important Drainage Projects, notably that of Nagpur Town have been designed and are being executed by Messrs. _____, under the general supervision of the Sanitary Engineer. Since the 1st of January the appointment of Sanitary Engineer has been placed in abeyance, as on account of the financial stringency it is impossible to take up projects on a large scale. The few works in progress have been made over to the ordinary Roads and Buildings staff.

The appointment of Electrical Inspector is a temporary one, the pay of the post being Rs. 500—40—700 per mensem. In all professional matters the Electrical Inspector ranks as an Executive Engineer and takes his orders direct from the Chief Engineer, the accounts of his office, however, are embodied in those of the Executive Engineer, Nagpur No. II Division, and all estimates prepared by him are submitted for sanction through the Executive Engineer, a similar procedure being followed in the case of all contracts proposed to be entered into by him.

An Assistant Architect was appointed for the Central Provinces in 1912, but the officer selected for the post was attached for training to the office of the Consulting Architect to the Government of India. The services of the officer in question have been lent to the Military Department, and although the Government of India have agreed to the appointment of a substitute as a temporary measure, no suitable officer was available for the purpose and it has been decided to leave the appointment in abeyance until the end of the war.

4. The Provincial Engineer Service is ordinarily recruited from two sources:—(a) by the appointment every year of a selected student from Roorkee College, and (b) from the Upper Subordinate establishment. Latterly, some recruitment has also been made from the ranks of the Temporary Engineers of the Province. As regards the recruitment from Roorkee College, one

APPENDIX IV—continued.

appointment is usually made annually; two students are appointed to the Province for a year's practical training, and the better of the two is selected to fill the appointment.

5. The Subordinate establishment is generally recruited from passed students of Roorkee College, appointments being usually made in the first place on the Temporary Establishment, selected men being promoted to the permanent establishment as vacancies occur. One permanent appointment of Upper Subordinate is guaranteed in alternate years for a student of the Roorkee College, preference being given to a native of the Central Provinces. It has been recently decided to guarantee annually two permanent appointments of Sub-Overseer, third grade, for students of the Engineering School of Nagpur. The number has been limited to two, as the number of students attending the school is at present very small. It is intended substantially to increase the number of such guaranteed appointments as the class grows.

6. One scholarship of Rs. 10 per mensem is given from the Armstrong Endowment Fund. It is tenable for two years, and is open to any native of the Central Provinces who desires to qualify for a Sub-Overseership in the Public Works Department of the Central Provinces, and may be held at the Thomason College, Roorkee, the Civil Engineering College, Sibpur, the College of Science, Poona, or the Engineering School, Nagpur. The election is in the hands of the Chief Engineer, and where there is more than one candidate the scholarship is awarded to the one who possesses the highest educational qualifications. Particulars of certain scholarships at the Engineering School, Nagpur, are given in the prospectus of the school, a copy* of which is attached to this memorandum, and the attached extracts from the Central Provinces Education Manual give general particulars of all the scholarships at various Engineering institutions. (Annexure A.)

7. As regards practical training of subordinates, the Upper Subordinate from Roorkee appointed to the permanent establishment, *vide* paragraph 5 above, is placed on a year's probation, during which he is placed under a selected Upper Subordinate for training, in accordance with the rules laid down in the Public Works Department Code. Arrangements have recently been made for the whole of the students of the Civil Engineering course at the Nagpur School to receive six months' practical training on works under selected Subordinates three months in the Irrigation Branch and three in the Roads and Buildings Branch.

8. The following statements are attached to this memorandum:—

- (i). Showing the areas of Circles and Divisional charges in the Central Provinces, and the average expenditure in each for the past three years. (Annexure B.)
- (ii). Showing the total expenditure incurred under various heads on works and establishment during each of the past five years. (Annexure C.)
- (iii). Showing the grants for major and minor works during the last five years. (Annexure D.)
- (iv). Showing the powers of Administrative and Technical sanction delegated by the Local Administration to Heads of Departments and Superintending and Executive Engineers. (Annexure E.)

ANNEXURE A.

Extract from the Central Provinces Education Manual regarding the grant of Scholarships.

VOLUME I.

211. Thirteen College scholarships—senior—are awarded annually, on the result of the First Arts or Intermediate Examination of the Calcutta and Allahabad Universities. Of these

Number, method of award, place and period of tenure.

11 are tenable for two years in any College of Arts in the Central Provinces, or in any College of Medicine or Engineering or Superior School of Art outside the Central Provinces. The remaining two are tenable in any College of Medicine only for two years. All these scholarships may, with the express sanction of the Director, be extended for such further period as may, in the circumstances of the particular case, be desirable to enable the scholarship-holder to complete his course of study.

N.B.—If both the scholarships reserved as above for Medicine are not taken up, one of them may be awarded for Engineering or in the School of Art.

212. College scholarships—senior—are of the value of Rs. 10 and Rs. 15 per mensem each. A scholarship-holder will receive, if each joins an institution in a town in which his parents or guardians reside, Rs. 10 per mensem, otherwise Rs. 15 per mensem.

(2). *Roorkee, Sibpur and Poona Engineering Scholarships.*

239. Two scholarships of the value of Rs. 40 and Rs. 20, respectively, tenable for three years, the former in the Engineer and Telegraph class, the latter in the Upper Subordinate class of the Thomason College, Roorkee, or in equivalent classes of Civil Engineering College, Sibpur, or the College of Science, Poona, will be offered to candidates from these Provinces who compete successfully in the Entrance Examination of those institutions. These scholarships will be tenable on the same conditions as scholarships awarded by the Thomason College, Roorkee, or the Civil Engineering College, Sibpur.

247. (1). Three scholarships will be awarded annually to students of the Central Provinces and Berar who wish to take a course of Technical training in Textile Industries or Electrical or Mechanical Engineering. Candidates must have been resident in the Central Provinces or Berar for not less than three years.

(2). Candidates must have passed the Matriculation examination of the Allahabad University (from a school in Central Provinces or Berar), but preference will be given to such as have passed the Intermediate or Bachelor of Science examination.

(3). The value of each scholarship will be Rs. 30 per mensem for those who have passed the Bachelor of Science examination and Rs. 25 for those who have passed the Matriculation or Intermediate examination. In the case of Europeans or Eurasians these scholarships will be increased by Rs. 5 in each case.

(4). These scholarships will ordinarily be tenable for three years, but may be extended to a fourth year if necessary.

(5). Every application must be accompanied by the following papers:—

- (a). Certificate of moral character.
- (b). Health certificate.
- (c). A statement giving the fullest information available as to the applicant's qualifications, physique and antecedents.

(6). Scholarships are liable to be withdrawn for failure to pass the usual examinations or misconduct.

(7). Applications must reach the Director of Public Instruction, Central Provinces, by the 1st November in each year.

The Balaram Das Technical Scholarship.

252. One Technical Scholarship of Rs. 12 per mensem tenable for two years at the Engineering Class, Nagpur, or for three years at the Agricultural College, Nagpur, or for four years at the Victoria Jubilee Technical Institute, Bombay, or Medical School, Patna, will be awarded when it falls vacant to a pupil of the Rajnandgaon High School who has passed the Matriculation examination of the Allahabad University. The scholarship was originally founded by Raja Bahadur Mahant Balram Das, Feudatory Chief of Nandgaon State.

* Not printed.

APPENDIX IV—continued.

The Meckenzie Scholarship.

254. The scholarship is tenable for four years in any College of Arts, Medicine or Engineering by the Hindu student of the Neil City High School, Nagpur, who passes highest in the first Matriculation examination that may occur after the scholarship is vacant. It is of the value of Rs. 7-8-0 per mensem.

The Browning Scholarships.

255. These scholarships are as below :—

(a). The Browning scholarship of Rs. 20 per mensem tenable for two years in any College of Arts or Law in the Central Provinces or in any recognised institution of College of Engineering, Medicine, Agriculture, or Art in British India.

* * * * *

The Wiggins Scholarship.

258. This scholarship is of the value of Rs. 2-4-0 per mensem, is open to any native student of the Saugor High School who passes the Entrance or School Final examination, and wishes to join a College of Arts or the Engineering Class, Nagpur.

The Rambaji Rao Scholarship.

263. The income accruing from Promissory Notes of the value of Rs. 9,000 is applied in founding three

scholarships of Rs. 10 per mensem each or of such other sum as the income may produce. The scholarships are open to students of Neil City High School, Nagpur, and are tenable for one year in any recognised College of Arts, Law, Medicine or Engineering in British India.

VOLUME II.

II.—Special.

104. The following scholarships have been instituted to commemorate the Jubilee of the Nagpur Volunteer Rifles :—

(1). The scholarships shall be known as "The Nagpur Volunteer Rifles Scholarships." They shall comprise :—

* * * * *

(c). One scholarship tenable for three years of Rs. 15 per mensem for the first and second years and Rs. 20 per mensem for the third year, to be held in the Civil Engineering Class of the Engineering School, Nagpur.

(d). One scholarship tenable for three years of Rs. 15 per mensem for the first and second year, Rs. 20 per mensem for the third year and Rs. 25 per mensem for the fourth year to be held in the Mechanical Engineering Class of the Engineering School when established at Nagpur.

ANNEXURE B.

Statement showing the number of Administrative, Divisional and Sub-Divisional Charges on the 1st April 1916, and approximate area of each Administrative and Divisional Charge and the average annual outlay (in round figures) for the preceding three years in Circle and Divisions.

NUMBER OF CHIEF ENGINEERSHIP.	SUPERINTENDING ENGINEERSHIP.			DIVISIONAL CHARGES.			Number of Sub-Divisions in each Division.	REMARKS.
	PERMANENT.		Average annual outlay for preceding three years.	PERMANENT.				
	Name of Circle.	Approximate area in square miles.		Name of Division.	Approximate area in square miles.	Average annual outlay for preceding three years.		
1	2	3	4	5	6	7	8	9
			Rs.			Rs.		
	First	40,443	37,22,000	Nagpur No. I	3,090	9,87,000	4	
				Nagpur No. II	3,178	5,79,000	3	
				Bhandara	7,097	2,78,000	2	
				East Berar	9,938	4,95,000	5	
				West Berar	7,828	6,21,000	4	
				Chanda	9,312	4,80,000	3	Since amalgamated with Bhandara on account of the War.
	Second	59,380	28,58,000	Jubbulpore	10,690	7,90,000	5	
				Mandla	5,057	2,76,000	3	Now called the Jubbulpore South Division with Headquarters at Jubbulpore.
				Hoshangabad	7,909	5,47,000	5	
				Plateau	11,709	4,89,000	3	
				Eastern	22,039	7,56,000	4	
	Sanitary Circle.	..	..	..	..	..	3	Special Sub-Divisions for Sanitary works only. Ordinary Roads and Buildings Sub-Divisions also carry out Sanitary works.
	Average	49,912	32,90,000		8,895	5,72,546		

APPENDIX IV—continued.

ANNEXURE C.

Expenditure incurred by the Central Provinces, Public Works Department, Buildings and Roads Branch, between the years 1911-12 and 1915-16 (including that for Local Bodies).

Years.	CIVIL BUILDINGS.		COMMUNICATIONS.		MISCELLANEOUS PUBLIC IMPROVEMENTS.		Total (columns 2 to 7).	ESTABLISHMENT CHARGES.			PERCENTAGE	
	Original works.	Repairs.	Original works.	Repairs.	Original works.	Repairs.		Direction.	Construction.	Total.	Of columns 10 to 8.	Of columns 11 to 8.
1	2	3	4	5	6	7	8	9	10	11	12	13
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Per cent.	Per cent.
1911-12	16,41,660	2,51,241	9,25,452	15,23,293	4,25,345	2,23,490	49,02,481	2,35,250	7,43,916	9,79,166	14.90	19.61
1912-13	23,00,957	2,91,874	11,56,353	16,42,150	4,40,484	2,16,192	60,57,010	2,68,102	7,30,510	9,98,612	12.06	16.49
1913-14	29,79,688	3,24,775	12,42,213	16,64,895	4,14,893	-62,865	65,63,599	2,92,734	7,46,108	10,38,842	11.36	15.82
1914-15	32,46,197	3,36,384	14,21,858	16,76,621	7,48,680	18,956	74,48,696	2,72,150	8,37,475	11,09,625	11.24	14.89
1915-16	24,19,437	3,36,524	12,21,743	16,33,397	6,73,149	16,587	63,00,837	2,78,690	8,55,220	11,33,919	13.57	17.90

Expenditure incurred by the Public Works Department for Local Bodies.

1911-12	93,866	177	39,350	12,936	3,94,350	9,291	5,40,970	..	..	..	..	..
1912-13	77,850	12	31,688	22,316	4,21,292	11,120	5,64,278	..	..	..	..	..
1913-14	2,44,402	414	50,418	33,701	4,01,001	12,844	7,32,780	..	..	..	..	..
1914-15	2,31,528	278	33,693	15,562	7,22,334	14,828	10,18,223	..	..	..	..	..
1915-16	2,66,617	50	18,248	13,335	6,78,040	11,835	9,88,125	..	..	..	..	..

ANNEXURE D.

Grants for Civil Works.

Years.	CIVIL BUILDINGS.		COMMUNICATIONS.		MISCELLANEOUS PUBLIC IMPROVEMENTS.		TOTAL.		GRAND TOTAL.
	Major.	Minor.	Major.	Minor.	Major.	Minor.	Major.	Minor.	
1	2	3	4	5	6	7	8	9	10
			IMPERIAL.						
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1911-12	20,000	17,970	..	..	..	..	20,000	17,970	37,970
1912-13	1,02,100	26,498	..	..	..	..	1,02,000	26,498	1,28,598
1913-14	2,63,788	28,398	..	..	..	..	2,63,788	28,398	2,92,186
1914-15	2,10,839	29,006	..	..	..	..	2,10,839	29,006	2,39,845
1915-16	1,56,208	20,890	..	..	..	..	1,56,208	20,890	1,77,098
			PROVINCIAL.						
1911-12	12,43,048	3,58,944	7,13,222	1,95,426	27,511	10,771	19,83,781	5,65,141	25,48,922
1912-13	17,19,635	4,48,873	9,31,347	1,27,339	23,567	4,693	26,74,549	5,60,905	32,55,454
1913-14	20,61,162	4,14,226	9,70,241	2,25,671	6,601	12,821	30,38,004	6,52,718	36,90,722
1914-15	23,46,450	4,16,763	11,43,795	2,31,487	19,041	9,266	35,09,286	6,57,516	41,66,802
1915-16	15,67,268	4,32,628	10,48,628	1,84,434	..	12,531	26,15,996	6,29,593	32,45,589

Total of Imperial and Provincial.

1911-12	12,63,048	3,76,914	7,13,222	1,95,426	27,511	10,771	20,03,781	5,83,111	25,86,892
1912-13	18,21,735	4,75,371	9,31,347	1,27,339	23,567	4,693	27,76,649	6,07,403	33,84,052
1913-14	23,24,950	4,42,624	9,70,241	2,25,671	6,601	12,821	33,01,792	6,81,116	39,82,908
1914-15	25,57,289	4,45,769	11,43,795	2,31,487	19,041	9,266	37,20,125	6,86,522	44,06,647
1915-16	17,23,576	4,53,518	10,48,628	1,84,434	..	12,531	27,72,204	6,50,483	34,22,687

APPENDIX V—continued.

permitted to engage their own subordinate staff if this was considered necessary and in practice the Councils did engage overseers and sub-overseers.

7. In 1909 Mr. Laurie, Commissioner, Nerbudda Division, represented that, as the Local Bodies had subordinate staffs, the Local Boards might be entrusted with the execution of minor works. After certain correspondence Sir Reginald Craddock transferred from the Deputy Commissioner to the District Councils and Local Boards in the Central Provinces the maintenance of roads of Class III and the execution of works, other than roads, estimated to cost less than Rs. 1,500.

8. Previous to this Sir Reginald Craddock, as Commissioner of the Nagpur Division, had started his scheme for a Divisional Local Fund Engineer for that Division. His proposals were contained in a note dated the 4th January 1906. He pointed out that as regards petty works, though the help of the Executive Engineer could be asked for, that officer had too much work to do to comply, or at least to comply promptly. The system of making over large works and the money for them to the Public Works Department was unsatisfactory, as it was practically impossible to watch or criticise the Public Works Department. The Provincial Government might just as well appropriate the road cess and undertake the whole work of road construction and maintenance. Petty works could not be supervised by the Executive Engineer, and consequently, the Deputy Commissioner had to sign bills without any expert assistance. Even an overseer on Rs. 60 a month would not be sufficient.

9. Sir Reginald Craddock therefore proposed the appointment of a divisional local fund engineer. It was not possible, he thought, to have district engineers as there would not be enough work for them to do. He suggested that a good many provincial roads might be handed over to the engineer. He also proposed that municipalities should contribute small sums. Sir John Miller permitted the introduction of the scheme in the Nagpur Division. In 1910 Sir Reginald Craddock decided to extend the scheme to all divisions in the Province. He decided (1) that every division should employ an engineer; (2) that every district should have a proper subordinate staff consisting of a district overseer with such subordinates under him as might be necessary; and (3) that such district roads at present provincial as could be maintained by their staffs should be handed over to the Councils with grants necessary for their maintenance. He directed the Chief Engineer and Commissioners to work out how this could be done and to discuss and determine a common line of action. As regards municipal contributions he thought that these should be of two kinds (a) a retaining fee entitling to advice and general inspection and (b) a percentage on works actually executed. He wished the scheme to be started by the 1st of April 1911.

10. Superintending Engineers then submitted their proposals for the transfer of roads and these were noted on by Mr. Harriot, the Chief Engineer, but nothing definite appears to have been done although in pursuance of Sir Reginald Craddock's orders divisional local fund engineers were actually appointed. Finally in the Administration's letter No. 889, dated the 18th July 1913, Sir Benjamin Robertson gave orders for the full introduction of the scheme. Transfers of roads were to be effected and in addition to maintenance grants there was to be a contribution of 11½ per cent. for tools and plant from the Public Works Department. In future years budget provision for the transferred works, including the extra 11½ per cent. would be made under the head "Civil works in charge of Civil officers" and not under the head "Civil works—Public Works Department." Similar orders were issued regarding the transfer of buildings, e.g., Police Stations, Excise buildings and Girls' Schools. All transfers of roads and buildings were to be completed by the 1st April 1914. As regards supervision by the Public Works Department it was remarked that this was impossible, as the Public Works Department staff was fully employed, but where a Superintending Engineer in the course of his tours found anything to remark on in the case of a transferred work,

he should send his criticisms to the Deputy Commissioner. It was also said that when the full scheme had been got into working order a report should be submitted showing for each district (1) the amount of expenditure undertaken by the new establishment; (2) the cost of the establishment; and (3) the manner in which it was being financed. It was added that the whole position should be reviewed so as to render possible a decision whether any alterations in the scheme were desirable.

11. Reports, varying in the degree of their completeness, have been received from all divisions. The report from the Nagpur Division has only just been received; the other reports, besides being incomplete in some cases are already largely out of date, so no attempt is made to summarize them.

12. *Annexure A.*—A statement is appended showing the amount spent by District Councils in each division during 1915-16 on works. Information of the amounts (included in those sums) representing money spent on transferred Provincial roads and buildings is not available. Nor is information available regarding works executed for municipalities by the divisional and district fund establishments.

13. *Annexure B.*—A statement is also appended, showing the establishment, with its pay, employed under the scheme.

14. The extent to which the functions of the divisional engineer are executive or consultative and supervisory appears to vary from division to division. The extremes seem to be the Nagpur Division on the one hand, where the engineer is very largely an executive officer, and the Berar Division on the other where he has no executive functions. In Berar the Commissioner says, "the control of their works staff is in the hands of the Boards, and the divisional engineer is treated purely as an advisory and inspecting officer without executive functions." The Commissioner of Nagpur in his report just received, says:—"Whatever the original intention was, I am afraid that it must now be confessed that the scheme has evolved into a measure of centralization which is most unsatisfactory to the local bodies concerned, and that it does not even possess the merit of efficiency, because the work expected of the divisional engineer is far more than he can accomplish." This result appears to me to be entirely due to the fact that the "rules" regarding the control and proper working of the Divisional Local Fund Engineer's scheme for the Nagpur Division" were framed on radically wrong lines. The very first rule is that the divisional local fund engineer will be in executive charge of works under the new scheme. The staff of supervisors and sub-overseers was placed under his direct orders. For all works costing over Rs. 500 the divisional local fund engineer was to select and appoint contractors and enter into the necessary agreements. The appointment, promotion and dismissal of supervisors was vested in the Commissioner and of sub-overseers in the Deputy Commissioner, but all recommendations in this connection were to be submitted by the divisional local fund engineer. The diaries of the supervisors were to be submitted to the divisional local fund engineer who would return them to the supervisor. The divisional engineer was to countersign all travelling allowance bills, and to grant casual leave and privilege leave to sub-overseers and supervisors, though in the case of privilege leave he had first to consult the local bodies. It is true that the local bodies were left with the power to sanction works under Rs. 500, under rule 4 the Chairman was required to sign completion certificates, and under rule 7 the diaries of the sub-overseers had to be submitted to the Chairman for perusal. For the rest, the powers of the local bodies were entirely eliminated, and it is not surprising that it should now be reported that they have ceased to take any interest in works.

* The Commissioner is here referring to rules issued in 1914 apparently by one of his predecessors.

APPENDIX V—concluded.

ANNEXURE A.

Expenditure incurred by District Councils and Boards on works in 1915-16.

Name of Division.	Expenditure on Civil works.	Expenditure on establishment, tools and plant.	Total.	REMARKS.
1	2	3	4	5
	Rs.	Rs.	Rs.	
Nagpur Division	3,31,431	62,069	3,93,500	
Jubbulpore "	2,22,858	36,886	2,59,744	
Nerbudda "	1,84,335	41,715	2,26,050	
Chhattisgarh "	2,59,388	23,530	2,82,918	
Berar "	5,50,034	85,857	6,35,891	
TOTAL	15,48,046	2,50,057	17,98,103	

NOTE.—In Berar no roads have as yet been transferred to District Boards for maintenance.

ANNEXURE B.

Details of pay, etc., of Divisional Local Fund Engineer Staff and District Fund Public Works Staff in Central Provinces and Berar.

Name of District Council.	DIVISIONAL LOCAL FUND ENGINEER AND STAFF.			DISTRICT ESTABLISHMENT.				TAHSIL ESTABLISHMENT.			
	Divisional Local Fund Engineer.	Clerks, draftsmen and tracers.	Peons, etc.	Supervisors (and overseers in Berar).	Horse allowance.	Clerks.	Peons.	Sub-overseers.	Horse allowance.	Peons.	
NAGPUR DIVISION	1 (350-550)	1 (80), 1 (60-70), 1 (50-60), 3 (40), 1 (35), 1 (30), 1 (25)	1 (15)(a), 1 (8), 2 (7), 1 (7)(b), 1 (2)(c)	..	..	..	..	..	..	..	(a). <i>Dafti.</i>
Nagpur	1 (125-150)	..	1 (40)	1 (7)	4 (50)	4 (15)	4 (7)	(b). <i>Chaukidar.</i>
Chanda	1 (150)	..	1 (40)	1 (7)	1 (50)	4 (15)	4 (7)	(c). <i>Sweeper.</i>
Bhandara	1 (80-100)	..	1 (30)	1 (7)	3 (50), 1 (30)(d)	4 (15)	3 (7)	(d). <i>Mistry.</i>
Balazhat	1 (150)	..	1 (40)	1 (7)	3 (50)	3 (15)	3 (7)	
Wardha	1 (150)	..	1 (40)	1 (7)	2 (50), 1 (40)	3 (15)	3 (7)	
JUBBULPORE DIVISION	1 (300-600)	1 (50), 1 (40), 1 (25)	3 (7)	..	..	..	..	..	..	..
Jubbulpore	1 (125)	1 (25)	1 (40)	1 (7)	1 (50), 2 (40), 1 (30)	4 (15)	4 (7)	
Saugor	1 (100)	1 (25)	1 (35)	1 (7)	1 (50), 1 (40), 2 (30)	4 (15)	4 (7)	
Damoh	1 (100)	1 (25)	1 (35)	1 (7)	1 (50), 1 (40), 2 (40)	2 (15)	2 (7)	
Seoni	1 (80)	1 (25)	1 (30)	1 (7)	..	2 (15)	2 (7)	
Mandla	1 (80)	1 (25)	1 (30)	1 (7)	1 (50), 1 (40)	2 (15)	2 (7)	
NERBUDDA DIVISION	1 (400-600)	1 (60-70), 1 (40-50), 1 (25-30), 1 (24-30)	3 (7), 1 (7)(e), 1 (2)(f)	..	..	..	..	..	..	..	(e). <i>Chaukidar.</i>
Hoshangabad	1 (90-120)	1 (25)	1 (30-35)	1 (7)	4 (40-50)	4 (15)	4 (7)	(f). <i>Parash.</i>
Nimar	1 (90-120)	1 (25)	1 (30-35)	1 (7)	2 (40-50), 1 (35-45)	3 (15)	3 (7)	
Chhindwara	1 (70-90)	1 (25)	1 (25-30)	1 (7)	1 (40-50), 2 (35-45)	3 (15)	3 (7)	
Betul	1 (70-90)	1 (25)	1 (25-30)	1 (7)	1 (40-50), 1 (35-45), 1 (30-40)	3 (15)	3 (7)	
Narsinghpur	1 (70-90)	1 (25)	1 (25-30)	1 (7)	1 (40-50), 1 (35-45)	2 (15)	2 (7)	
CHHATTISGARH DIVISION.	1 (300-400)	1 (60), 1 (45), 1 (30), 1 (25)	3 (7)	..	..	..	..	..	..	..
Raipur	1 (125-150)	1 (25)	1 (30)	1 (7)	1 (60), 1 (50), 2 (40), 1 (35)	5 (15)	..	
Bilaspur	1 (100-125)	1 (25)	1 (30)	1 (7)	1 (50), 2 (40), 1 (35)	4 (15)	..	
Drug	1 (80-100)	1 (25)	1 (30)	1 (7)	1 (50), 2 (40), 1 (35)	4 (15)	..	
BERAR DIVISION	1 (400-600) (k) 1 (500 average).	1 (50-60), 1 (40-50), 1 (25-35), 1 (20-30)	3 (8)	..	..	..	..	..	..	..
Amraoti	..	informa- tion not available	..	1 (150-200), 1 (80), 1 (60)	..	..	..	2 (50), 3 (40), 1 (30)	H	H	(g). <i>Overseers.</i>
Akola	1 (150-200), 1 (80), 1 (60)	H	H	H	2 (50), 4 (40), 1 (30)	H	H	(k). <i>Exact pay of the appointment is not available.</i>
Buldana	1 (100-120), 1 (60)(g)	..	..	..	2 (50), 3 (40), 1 (30)	..	..
Yeotmal	1 (100-120), 1 (60-70)(g)	..	..	..	2 (50), 3 (40), 1 (30)	..	..

(H) Details are not available.

NOTE.—The Nagpur Division figures have been obtained from the Commissioner's Office.

APPENDIX VI.

APPENDIX VI.

Letter from the Hon'ble Mr. H. H. Green, Secretary to the Government of Bengal, Public Works Department, to the Secretary, Public Works Department Reorganization Committee, No. 492-E., dated the 29th January 1917.

I am directed to refer to Mr. Rose's letter No. 555 E. A., dated the 15th November 1916, on the subject of the proposed reorganization of the Public Works Department, and to state briefly what are the present views of this Government. At the same time I am to say that His Excellency in Council would have preferred to postpone his remarks until he had an opportunity of perusing the evidence and the report of the Committee. Such opinion as he may now express should therefore be considered as provisional and as subject to revision hereafter in the light of the evidence and the report.

2. The first point on which the views of the Local Government are desired is *whether the methods at present adopted for the execution of civil works are economical and suitable for the purpose for which they were devised.* In this connection I am to refer to the Local Government's letter No. 91 T.—A.,* dated the 16th May 1914. The Governor in Council has not seen any reason to modify the opinions which he then expressed, nor has the Hon'ble Nawab Sir Syed Shams-ul-Huda seen any reason to modify his note of dissent. The present opinion of the majority of the Council may therefore be taken to be that, on the whole, the existing system is fairly economical and fairly suitable.

3. The second point for consideration is *whether, under the existing system, private enterprise is sufficiently encouraged, and whether it is possible and desirable to entrust the construction and upkeep of certain classes of public works to agency other than departmental, and, if so, upon what lines such change should be effected.* On this question I am to say that in Bengal the Public Works Department does very little work on a purely departmental basis. Practically all work is given out to contractors, large or small, closely supervised by the officers of the Public Works Department. Except in small works it is customary for different portions of the work to be entrusted to different contractors. In Calcutta there are several large firms of "master contractors." Those firms are generally unwilling to take up work in the *mufassal*, unless the work be on a large scale, such as the buildings at Dacca. As regards petty contractors, they exist in large numbers, both in Calcutta and in the *mufassal*. They are generally men of small capital and an easy standard of integrity. Their work requires constant supervision at every stage. On the whole, the Governor in Council is of opinion that private enterprise, large and small, is at present receiving reasonable encouragement in this province. He is, however, quite prepared to entrust more work to reliable firms of master contractors, not only in Calcutta, but also (if and when they are prepared to undertake it) in the *mufassal*. He recognises that the work of such master contractors as already have earned a reputation for reliable work requires less supervision than the work of petty contractors. He also recognises that those master contractors have a right to expect that entire projects will be entrusted to them, and that they will not be asked to tender for specific portions of the work. One advantage in entrusting a whole project to a reliable master contractor is that once his tender has been made and accepted, the ultimate cost of the project is definitely known. Under the present system, on the other hand, it is inevitable that sanctioned estimates will sometimes be exceeded.

4. As regards the next point, namely, *whether any changes recommended by the Committee necessitate any modification of the organization of the staff of the Public Works Department and, if so, what,* the opinion of the Governor in Council may be briefly expressed by saying that so long as the master contractors mentioned above are unwilling to do work in the *mufassal* it is not

possible to propose any drastic changes in the staff of the Public Works Department. The Governor in Council anticipates, however, that if more projects be entrusted to master contractors in Calcutta new and reliable firms will gradually spring up, capable and willing of undertaking work in the *mufassal*. When this comes about a gradual reorganization and reduction of the Public Works Department will follow as a necessary sequence.

5. The next point is *whether the Public Works Department meets the needs of other departments of the Administration, and whether the relations inter se of the various sub-divisions of the Buildings and Roads Branch, Sanitary, Architectural, Electrical and Civil Engineering are satisfactory.* In reply, I am to say that while officers of other departments frequently indulge in more or less severe criticisms of the Public Works Department just as they indulge in similar criticisms of the Accountant-General and his staff, yet, on the whole, the relations between the Public Works Department and other departments are cordial. Those who are most forward in their criticisms are often the first to acknowledge that they have not studied the problem in detail and to admit that the Public Works Department has very special difficulties to meet and that it does its best to meet them. As regards the relations inter se of the various sub-divisions of the Roads and Buildings Branch of the Public Works Department, I am to say that in this province they are generally satisfactory. Incidentally the Governor in Council would warmly welcome an increase in the Architectural staff of the province. He is much impressed by the present insufficiency of trained architects.

6. As to *whether further decentralization within the Public Works Department itself is desirable, and, if so, to what extent and in what directions,* the opinion of the Governor in Council is that further decentralization is desirable, particularly in the direction of giving larger powers to Superintending Engineers.

7. The next point is *whether the Public Works Department Code, which regulates the execution and maintenance of civil works, is unduly restrictive and, if so, in what direction change is desirable.* On this point I am to say that the opinion of the Governor in Council is decidedly in the affirmative. The conditions vary so greatly in different provinces that the Governor in Council would like to see much less in an "all-India" Code and much more left to the discretion of Local Governments. As an outstanding example of the defects of the present system, I am to allude to the hard-and-fast rules regarding residential buildings, the admissible outlay upon the same, and the rent which the occupants have to pay to the State. It is not too much to say that, for no fault on the part of the Public Works officers in Bengal, the Government officials in this province live, as a whole, in unsuitable houses, with meagre compounds and excessive rents.

8. The next question is large and difficult, and is formulated thus: *whether the system of education in Government Engineering Colleges is organized on a sufficiently broad basis to meet the needs of private agency as well as of Government, whether it attracts suitable candidates and whether the standard of instruction is sufficiently advanced to provide fully qualified Civil Engineers for employment by Government, local bodies, and private engineering contracting firms, and, if not, in what directions and to what extent improvement is required.* Without going into details, which will be placed before the Committee in the evidence of Mr. Heaton, I am to say that on the whole the Civil Engineering College at Sibpur meets the needs of private agency as well as of Government, and that it attracts suitable candidates who afterwards reflect credit upon it. There is, however,

* Annexure A.

APPENDIX VI—continued.

one aspect of the institution which the Governor in Council cannot regard without misgiving. Although the majority of the people of Bengal are Muhammadans and although Muhammadans have a special aptitude for engineering (as witnessed by their marked success as practical engineers both on shore and in steamers) yet the students in Sibpur are almost entirely composed of Hindus and Anglo-Indians. This is mainly due to the poverty of Muhammadan students and to their desire to earn a livelihood by the cheapest and quickest means. As a result, Bengal is now turning out practically no Muhammadans, not only in the higher ranks of engineering but also in the higher ranks of medicine. The problem is receiving the anxious consideration of His Excellency in Council. In connection with the present state of efficiency in Sibpur College, it must be borne in mind that the institution has been greatly hampered for many years by schemes for its removal to Ranchi and for the establishment of an Engineering College at Dacca and a Technological Institute in Calcutta. The existence of these schemes—which, for various reasons have not borne fruit—has undoubtedly prejudiced the development of Sibpur College partly by the restriction of capital expenditure and partly by the general feeling of uncertainty.

9. The last point is *whether adequate provision is made for the practical training on works of students who have received their scientific education in English or Indian Colleges*. The Governor in Council understands that the question relates to Civil Engineering and therein mainly to Indian students. Those who have passed through Sibpur College have received, as already mentioned, a good scientific training and also, as far as possible, a good practical training. But, in order to be thoroughly efficient, they undoubtedly require a further practical training on actual works. The few who are selected for the higher ranks of the Public Works Department receive such a systematic training and the large contractors in Calcutta (particularly the Indian firms) can and do give such a training to those who enter their service. The Governor in Council would welcome a more general readiness on the part of European firms to give practical training on works to the passed students of Sibpur, with a view to their ultimate employment in responsible positions under those firms. It cannot, however, be denied that there are faults on both sides, and it is reported that some of the passed students of Sibpur appear to think that they have nothing further to learn.

10. In conclusion, I am to revert to the second subject in the resolution particularly in so far as it affects local bodies. In this province the Public Works Department does not carry out works for local bodies. The Calcutta Corporation has, of course, its own staff of highly trained engineers, which carries out all its works. The *mufassal* municipalities engage engineers of the overseer and sub-overseer class, who carry out their own works, generally of an unimportant nature. The District Boards, on the other hand, all employ more or less competent "District Engineers" with subordinate staffs below them. I am to annex a statement* showing the necessary qualifications for District Engineers and the actual qualifications and rates of pay of the present incumbents of those posts. An experiment was tried in the "Nineties" of entrusting District Boards (through their District Engineers) with carrying out Government works in addition to the works of the Board. The experiment met with varying success in different districts, but was finally condemned and abandoned. On the whole, the Governor in Council is not in favour of renewing the experiment, although it has undoubtedly some attractive features, particularly from the point of view of the District Officer. The reasons which weigh with the Governor in Council in not recommending a renewal of the experiment are that those District Boards which can afford a first-rate District Engineer have so much work of their own that the District Engineer cannot take up Government work in addition to his

primary duties; that no man can serve two masters without the danger of constant friction; and, lastly, that if the system of non-official Chairmen be introduced in District Boards, it will be impossible to ask the Boards to place their engineering establishment under the partial control of Government in the Public Works Department.

11. For the assistance of the Committee I am to annex† a note drawn up by the Chief Engineer showing the existing organization and methods followed in the execution of works in Bengal.

ANNEXURE A.

Letter from the Hon'ble Mr. H. H. Green, Secretary to the Government of Bengal, Public Works Department, to the Secretary to the Government of India, Public Works Department, No. 91-T-A., dated the 16th May 1914.

I am directed to acknowledge the receipt of your letter No. 904-A.G., dated the 3rd September 1912, on the subject of possible economies in the scale of expenditure on unremunerative public works. In that letter the Government of India point out that, provided proper economy is observed in regard to the scale of accommodation provided for public and administrative offices and buildings, any further economy must lie (a) in the reduction of the rates for various classes of work and materials if this is possible, and (b) in the adoption in the case of minor buildings of a less durable and cheaper class of construction.

2. The Government of India ask with regard to (a) that investigation may be made into the suggestion that the rates which are paid by the Public Works Department to contractors for materials and work are generally in excess of those which are paid by the general public, and with regard to (b), whether available records will permit of a comparison of the initial cost of minor buildings, plus the cost of repairs and renewals, in the case of *kutch* construction, with similar expenditure in the case of *pucca* construction for the same class of buildings, and whether in the opinion of this Government economy can be obtained by a reversion to the old policy of a cheaper type of construction for such minor buildings.

3. The Government of India further ask this Government to consider the possibility of reducing the superior establishment by extending charges of supervision in consequence of the general improvement in recent years in facilities for communication by rail and road.

4. As to the reduction of rates for various classes of work and materials, I am to say that enquiries have been made in the matter of the rates paid for several large buildings in Calcutta by private firms, and those rates have been compared with the Public Works Department rates for the same class of work. From a comparison of this sort, it is extremely difficult to arrive at a definite result, as so much depends on the specification for each class of work, on the details of the construction and the preparation of the various materials used during the construction, which can only be accurately ascertained by supervision of the work while in progress. A fairly clear indication of the actual facts has, however, been secured through a comparison of the cost of work done on the Commerce and Industry building in Council House Street, Calcutta, which was built by the Public Works Department, and on the _____ building built by Messrs. _____, a well-known firm of Calcutta contractors. Both of these buildings have been constructed during the last three years. From the accompanying statement (marked A) of the cost of the chief items of work, viz., (1) concrete, (2) brick-in-lime, (3) steel work, (4) terracing (5) Indian patent-stone and (6) doors and windows, it will be seen that the actual cost of this work in the _____ building, had it been constructed by the Public Works Department at the rates on which the work on the Commerce and Industry building was carried out, would have

* Annexure B.

† Annexure C.

APPENDIX VI—continued.

been Rs. 1,962 more on a total of Rs. 98,624, i.e., about 2 per cent. more. It has also been ascertained that _____ paid for supervision of their building Rs. 300 a month, while the Public Works Department charges for the work establishment directly employed in the construction of the Commerce and Industry building amounted to Rs. 370 a month. The total cost of the _____ building was Rs. 2,15,331 against Rs. 10,04,194, the cost of the Commerce and Industry building, a much larger building, while the monthly cost of establishment for the former was Rs. 300 and for the latter Rs. 370 or 14 per cent. in the former case and 037 per cent. in the latter. It may be argued that, in addition to the establishment employed directly upon the Commerce and Industry building there is a large controlling establishment of Executive Engineers, Superintending Engineers and Chief Engineers, but whether buildings are carried out by the Public Works Department as they are now or if they be made over altogether to large contractors without any supervision of the details of the work, this controlling establishment will be necessary, unless departmental officers are found to be competent to inspect works while in progress to check the quality of the work and to take measurements of the work done for payment. Recent cases, however, have shown how impossible departmental officers find it to arrange for and carry out building works without the aid of the Public Works Department. As a matter of fact, it would also still be necessary to employ a portion of the establishment now considered as directly chargeable to the work, and in the case of the Commerce and Industry building it would have been necessary to employ a clerk of works or Sub-divisional Officer at Rs. 200 a month, together with a sub-overseer to assist him in measurement at Rs. 50 a month, and a sub-divisional clerk at Rs. 35 a month. Thus the saving in establishment by making the work over wholesale to a contractor would have been very small—about Rs. 85 a month.

5. In this connection I am also to forward herewith a statement showing the cost of the same building, if constructed at rates actually paid by the Public Works Department in the Government Telegraph Office extension, Calcutta (recently completed). The statement shows that had the _____ building been constructed by the Public Works Department at the rates paid in the Telegraph Office extension there would have been a saving of Rs. 1,220 on the amount paid to Messrs. _____.

6. Further comparisons have been made with the rates entered in estimates which have been prepared at different times by firms of building contractors for buildings constructed by them for private educational institutions in Calcutta. The results obtained by these comparisons show that the rates paid for different items of work on these buildings differed but slightly from those entered in the Public Works Department schedule of rates for similar items of work.

7. When comparing rates entered in an estimate prepared by a private firm with those entered in the Public Works Department schedule of rates, it has to be remembered that in some items, such as wood work and steel work allowance has been made in the Public Works Department schedule rates for fluctuations in the market rate of the materials, and that the actual rates paid are frequently less than those scheduled. At the same time the Governor in Council recognises that it is desirable to give out large works from time to time to approved contractors to assist Government in checking the rates paid and the work done in the department and this policy will be continued.

8. For works in the *mufassal* investigations have been made by the Superintending Engineers, Northern and Eastern Circles, and the information collected by them shows that the Public Works Department rates in the Northern Circle are not in excess of, and are in some instances lower than, those paid by private firms, while the Public Works Department work is believed to be superior. In the Eastern Circle the Public Works Department rates are in some cases rather in excess of

those paid by private parties, but it is claimed that the Public Works Department work here also is superior. The official residences at Dacca, for which Messrs. _____ tendered at Rs. 8-8 per square foot, were constructed by the Public Works Department, and it will be seen from the statement attached (marked B) that the actual average cost per square foot of plinth area was Rs. 8-8, which is the same as the rate tendered for these buildings; by Messrs. _____.

9. The comparison in statement attached (marked C) of the rates paid by this department in 1909 with those paid in 1882 (27 years before) shows how little rates in Calcutta have increased in spite of the large increase in general wages.

10. The Public Works Department in this province does practically no work by daily labour; all the work is done by contract, and it is open to any contractor, large or small, to tender. It doubtless would pay firms of contractors of good standing to take up large buildings in Calcutta, and possibly also in some *mufassal* stations, as they would thus keep in their own hands all the profits arising out of the imported materials, such as steel beams, tees, etc. They would also secure the supply of bricks, lime, *soorki*, doors and windows, and the profit now distributed among the suppliers of these materials would accrue to them, and they could with a small establishment keep efficient control over large works situated in one place. The difficulty which would arise would be in arranging for the repairs and the construction of buildings scattered all over the province; some of them costing not more than two or three thousand rupees, for which materials have to be collected and brought from great distances. For such works it will be necessary to retain a large subordinate establishment in the Public Works Department, who would not have the excellent training they get at present on large buildings carried out in the various headquarters towns. Further, the abolition of the present system of work in Calcutta under which the Public Works Department has its own brick-fields where a constant supply of bricks can be had at the same price, under which tenders are invited from various firms for lime and other materials, and under which the steel work is imported direct from Europe, would lead in a few years to a general rise in rates, as at present the rates in Calcutta are controlled more or less by the Public Works Department rates.

The Public Works Department insists on a high standard of work, but it is doubtful whether there is sufficient competition among building contractors in Calcutta to maintain that high standard should the present Public Works Department system of doing work be abolished.

11. In the circumstances set forth above, the Governor in Council does not consider that the rates paid by the Public Works Department are high as compared with the rates paid by private people, taking the quality of the work done into consideration, and does not consider that it is possible to make any material reduction in the rates for various classes of work and materials as now paid by the department. I am, however, directed to suggest that if the Government of India desire that further investigation should be made in this matter, a small committee may be appointed to examine the figures and contentions given in this letter and test them further. Such a committee should consist of Public Works Department officers and non-official members, the latter to be engineers employed by public bodies or railways. It would not be advisable to have on the committee persons interested in the building trade although such persons might properly be examined as witnesses before the committee.

12. As regards the adoption in the case of minor buildings of a less durable and cheaper class of construction this Government has made some enquiries, but is not prepared as yet to express a final opinion. The evidence obtained hitherto does not encourage the view that economy would actually result from such a change, but further enquiries are being made.

13. Regarding the possibility of reducing the superior establishment by extending charges of supervision, I

APPENDIX VI—continued.

am to state that the charges of superior establishment in Bengal have only recently come under examination, on the recent rearrangement of the province, and in the opinion of this Government no reduction is possible; in fact, with the increasing amount of work now being undertaken by the department, a larger establishment will be required in the near future.

14. I am to enclose for the information of the Government of India a note of dissent which has been recorded by the Hon'ble Nawab Syed Shams-ul-Huda regarding

the conclusions which have been embodied in the first part of this letter. The Hon'ble Nawab is of opinion that in comparing the cost of construction by the Public Works Department with the cost of construction by private firms, the pay of the superior establishment of the Public Works Department should be included and not excluded. His Excellency recognises that the point is arguable, but the conclusion set out in paragraph 4 of this letter represents the opinion of the majority of the Council.

A

Statement showing the difference of cost for the proposed new building at _____ for _____ as per Messrs. _____'s rate, ordinary Public Works Department schedule rate, and the rate actually paid in Commerce and Industry Secretariat.

DESCRIPTION OF WORK.	Quantity.	MESSRS.—'s ESTIMATE.			COST AT ORDINARY SCHEDULE RATE.			COST AT RATE ACTUALLY PAID IN COMMERCE AND INDUSTRY SECRETARIAT.		
		Rate.	Unit.	Cost.	Rate.	Unit.	Cost.	Rate.	Unit.	Cost.
		C. ft.	Rs. A.	Rs.	Rs. A. P.	Rs.	Rs. A. P.	Rs.		
Concrete	14,908	30 0	Per cent.	4,472	32 5 0	Per cent.	4,817	33 14 0	Per cent.	5,050
Brick-in-lime in floor and plinth	13,570	31 0	"	4,207	34 14 0	"	4,733	35 13 8	"	4,865
Ditto in ground floor	26,941	32 0	"	8,621	33 14 0	"	9,126	36 7 0	"	9,817
Ditto in first	16,258	33 0	"	5,365	35 6 0	"	5,751	36 7 0	"	5,924
Ditto in second	13,488	34 0	"	4,586	36 14 0	"	4,974	36 7 0	"	4,915
Ditto in third	10,551	35 0	"	3,693	38 6 0	"	4,049	36 0 0	"	3,798
Ditto in fourth	7,089	36 0	"	2,552	39 14 0	"	2,827	40 0 0	"	2,836
Rolled steel joists	2,570	7 0	Cwt.	17,990	7 8 0	Cwt.	19,275	6 5 0	Cwt.	16,224
Steel tees	921	7 8	"	6,909	8 8 0	"	7,828	5 11 5	"	5,262
Roofing terracing fifth floor	1,798	33 0	Per cent.	593	36 0 0	Per cent.	647	33 0 0	Per cent.	593
Ditto fourth	8,645	33 0	"	2,853	35 0 0	"	3,026	33 0 0	"	2,853
Ditto third	9,079	33 0	"	2,996	34 0 0	"	3,087	33 0 0	"	2,996
Ditto second	8,515	33 0	"	2,810	33 0 0	"	2,810	33 0 0	"	2,810
Ditto first	8,335	33 0	"	2,751	32 0 0	"	2,667	33 0 0	"	2,751
Ditto mezzanine	2,134	33 0	"	704	32 0 0	"	683	33 0 0	"	704
1" Indian patent-stone	30,705	26 0	"	7,982	25 0 0	"	7,676	26 0 0	"	7,982
Venetian sashes and frames	3,925	2 10	S. ft.	10,302	3 2 0	S. ft.	12,263	3 1 9	S. ft.	12,204
Swing doors and frames	200	1 12	"	350	1 11 6	"	344	1 11 6	"	344
Panel ditto	1,907	1 12	"	3,338	1 11 6	"	3,278	1 11 6	"	3,278
Batten ditto	1,114	1 6	"	1,532	1 6 0	"	1,532	1 6 0	"	1,532
Fanlight and frames	1,199	1 8	"	1,799	1 10 6	"	1,986	1 9 2	"	1,886
TOTAL				96,405			1,03,382			98,624
Rest of the items				1,18,926			1,18,926			1,18,926
Total cost of work				2,15,331			2,22,308			2,17,550
Deduct—If sand, soorki and lime is used instead of soorki and lime as was done by Messrs. _____										257
GRAND TOTAL										2,17,293

Statement showing the cost of the proposed new building at _____ for _____ if constructed at rates actually paid in the Government Telegraph Office extension.

Item No.	Description of work.	Quantity.	Rate as actually paid in Telegraph Office extension.	Cost.
		C. ft.	Rs. A. P.	Rs.
1	Concrete-in-lime	14,908	33 14 0	5,050
2	Brick-in-lime in foundation and plinth	13,570	34 14 0	4,733
3	Ditto in ground floor	26,941	33 14 0	9,126
4	Ditto in first	16,258	34 14 0	5,670
5	Ditto in second	13,488	35 14 0	4,839
6	Ditto in third	10,551	36 14 0	3,891
7	Ditto in fourth " and parapet	7,089	37 14 0	2,685
8	Rolled steel joists	2,570	6 3 0	15,460
9	Steel tees	921	5 11 5	5,262
10	Roofing terracing over 18" tiles, fifth floor	1,798	33 0 0	593
11	Ditto ditto fourth floor	8,645	33 0 0	2,853
12	Ditto ditto third	9,079	33 0 0	2,996
13	Ditto ditto second	8,515	33 0 0	2,810
14	Ditto ditto first	8,335	33 0 0	2,751
15	Roofing terracing over mezzanine	2,134	33 0 0	704
16	1" Indian patent-stone	30,705	24 1 0	7,368
17	Venetian sashes and frames	3,925	2 15 3	11,591
18	Swing doors and frames	200	1 11 6	344
19	Panel ditto	1,907	1 11 6	3,278
20	Batten ditto	1,114	1 6 0	1,532
21	Fanlight and frames	1,199	1 9 2	1,886
	Rest of the items			96,442
	Total cost of work			2,14,368
	Total cost as constructed by Messrs. _____			2,15,331
	Saving if constructed by Public Works Department over Messrs. _____			963
	Add—Difference in specification			257
	GRAND TOTAL			1,220

APPENDIX VI—continued.

B

Statement showing the actual cost and plinth area of 19 official residences at Dacca constructed by the Public Works Department for which Messrs. _____ tendered an average rate of Rs. 8-8 per square foot.

Residence of—	As constructed by Public Works Department.	
	Plinth area. [Sq. feet.	Cost. Rs.
Accountant-General	5,170	42,329
Deputy Accountant-General	2,180	21,246
Commissioner	7,625	60,766
First Member, Board of Revenue	6,743	63,978
Second ditto	7,625	55,943
Secretary, Board of Revenue	3,747	33,194
Legal Remembrancer	4,435	42,646
Director of Land Records	2,656	23,978
Do. of Public Instruction	3,521	23,410
Principal, Dacca College	3,600	37,096
District Judge	5,170	44,271
Joint-Magistrate	2,334	21,945
Professors, Dacca College	4,733	32,464
Inspector-General of Police	3,856	32,630
Deputy Inspector-General of Police	3,412	28,407
Superintendent of Police	2,334	21,525
Deputy Sanitary Commissioner	2,316	21,032
Superintending Engineer	4,205	33,953
Executive Engineer	2,302	22,742
TOTAL	77,964	6,63,555

Rs. A.
Rate per square foot = $\frac{6,63,555}{77,964} = 8\ 8$

C

Statement showing differences of rates in the years 1882 and 1909.

DESCRIPTION OF WORK.	CALCUTTA.			CUTTACK.			RANCHI.			MUZAFFARPUR.			REMARKS.
	1882.	1909.	Difference.	1882.	1909.	Difference.	1882.	1909.	Difference.	1882.	1909.	Difference.	
	Rs. A.	Rs. A. P.	Rs. A. P.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A. P.	Rs. A. P.	Rs. A.	Rs. A.	Rs. A.	
1. Brick concrete (including filling).	24 10	(a)27 12 0	3 2 0	15 8	18 0	2 8	16 12	20 0 0	3 4 0	18 15	18 0	0 15	(a) Rs. 30-14 is for engine mixed with slaked phooting lime.
2. New work with burnt bricks-in-lime mortar in foundation and plinth (with bullock mill for mixing mortar).	30 6	(b)30 8 0	0 2 0	16 0	21 0 to 23 0	5 0 to 7 0	19 0	27 0 0	8 0 0	18 14	22 0	3 2	(b) Rs. 32-12 is for engine mixed with stone lime.
3. New work with burnt bricks-in-lime mortar from foundation up to height of 24' above ground.	32 0	(c)32 4 0	0 4 0	17 0	22 0 to 24 0	5 0 to 7 0	20 8	29 8 0	9 0 0	19 14	23 0	3 2	(c) Rs. 33 is for engine mixed with stone lime.
4. New work with burnt bricks-in-lime mortar from 24' to 45' above ground.	32 0	(d)33 12 0	1 12 0	..	24 0 to 26 0	..	22 8	31 5 0	8 13 0	21 3	26 0	4 13	(d) Rs. 34-8 is for engine mixed with stone lime.
5. Teakwood scantling in door-frames fitted and fixed.	3 4	4 8 0	1 4 0	..	..	..	5 0	5 0 0	..	4 0	4 0	..	
6. Sal wood scantling in door frames fitted and fixed.	3 8	3 8 0	..	..	2 8 to 3 0	..	1 10	4 0 0	2 8 0	3 0	3 8	0 8	
7. 1½" teak venetian doors.	0 14	1 2 8	0 4 8	..	..	..	1 4	1 2 3 0	1 9	1 5	1 5	..	
8. 1½" teak panel doors	0 14	1 4 0	0 6 0	..	..	..	1 2	1 0 0 0	2 0	1 3	1 5	0 2	
9. 1½" teak glazed doors.	0 14	0 14 8	0 0 8	..	..	..	1 2	0 14 9 0	3 3	1 0	1 1	0 1	
10. 1½" teak batten doors.	0 13	0 14 0	0 1 0	..	..	..	1 0	1 0 0	..	1 0	1 0	..	
11. 1½" teak ½ glazed and ½ panel.	0 14	0 15 0	0 1 0	..	..	..	1 3	1 2 0 0	1 0	1 2	1 5	0 3	

APPENDIX VI—continued.

Note of dissent.

I THINK a case has been made out for an enquiry regarding the possibility of reduction in the Public Works Department rates for the various classes of work and materials. In accepting the contrary view, a great deal of reliance has been placed on a statement showing the cost of the ————building as per Messrs. ————'s estimate, and the cost according to the rate actually paid for the Commerce and Industry Secretariat built under the supervision of the Public Works Department. The difference in the two rates is shown in the annexed statement. It will be seen that according to Messrs. ————'s estimates the total costs work out at Rs. 2,15,331, and according to the Commerce and Industry building rates it is Rs. 2,17,293. At first sight the difference appears to be small, but it must be remembered that the Public Works Department rates do not cover the cost of supervision which according to Mr. Finnimore amounts to about 10 per cent. in Calcutta and 17 per cent. in the whole province. The cost to Government would therefore be represented by—

Rs.
2,17,293
21,729
—————
2,39,022

On the other hand, Messrs. ————'s estimate re-

present a considerable margin of profit besides supervision charges. Taking the profit to be about 10 per cent. the actual cost to Messrs. ———— including supervision and establishment charges must have been about Rs. 1,93,798. Thus the cost to Government according to the Public Works Department rates are roughly about 23 per cent. higher. It may, however, be noted that the cheaper rates and smaller weights for steel joists and tees have led to a reduction of Public Works Department estimates by Rs. 3,413. This reduction in the price of imported articles is probably due to a fluctuation of the metal market which is more or less a matter of chance. If this difference is taken out of consideration, the rates payable by Government for the Commerce and Industry building would be found nearly 25 per cent. higher than the rates actually paid by Messrs. ————. The possibility of economy, therefore, seems to be well established. It is possible that I have over-estimated the margin of profit included in the rates of Messrs. ————, but as to this we have no alternative but to speculate. If an enquiry were held these could be cleared up, and I would strongly suggest such an enquiry. It should also be remembered that the 10 per cent. additional cost of supervision to Government does not include the pay of the Secretariat establishment of the Public Works Department.

S. HUDA.

The 11th May 1914.

Description of work.	Messrs. ————'s rate.	Rate paid in Commerce and Industry Secretariat.	Difference between columns 2 and 3.
1	2	3	4
	Rs. A.	Rs. A. P.	Rs. A. P.
Concrete	30 0 per cent.	33 14 0 per cent.	3 14 0
Brick-in-lime in floor and plinth	31 0 "	35 13 8 "	4 13 8
" in ground floor	32 0 "	36 7 0 "	4 7 0
" in first	33 0 "	36 7 0 "	3 7 0
" in second	34 0 "	36 7 0 "	2 7 0
" in third	35 0 "	36 0 0 "	1 0 0
" in fourth	36 0 "	40 0 0 "	4 0 0
Rolled steel joists	7 0 per cwt.	6 5 0 per cwt.	0 11 0
Steel tees	7 8 "	5 11 5 "	1 12 7
Roofing terracing fifth floor	33 0 per cent. "	33 0 0 per cent.	.....
Ditto fourth	33 0 "	33 0 0 "	.....
Ditto third	33 0 "	33 0 0 "	.....
Ditto second	33 0 "	33 0 0 "	.....
Ditto first	33 0 "	33 0 0 "	.....
Ditto mezzanine	33 0 "	33 0 0 "	.....
1" Indian patent-stone	26 0 "	26 0 0 "	.....
Venetian sashes and frames	2 10 per s. ft.	3 1 9 per s. ft.	0 7 9
Swing doors and frames	1 12 "	1 11 6 "	0 0 6
Panel ditto	1 12 "	1 11 6 "	0 0 6
Batten ditto	1 6 "	1 6 0 "	.....
Fanlight and frames	1 8 "	1 9 2 "	0 1 2

ANNEXURE B.

Qualifications of candidates for employment as District Engineers, Bengal.

Rule 2.—A candidate for first employment as District Engineer must be qualified in one of the manners following that is to say, he must—

(a) be at the time of seeking the employment, or have previously been, a member of the permanent establishment of the Public Works Department in the grade of Executive or Assistant Engineer or Sub-Engineer or Supervisor;

(b) hold the degree of Bachelor of Engineering or be a Licentiate of Engineering of the Calcutta University, or have passed the final examination of the Engineering Department of the Civil Engineering College at Sibpur,

or the final examination of the Engineering Department of the Colleges of Engineering of Roorkee, Madras or Poona;

(c) have served an apprenticeship of not less than three years in the United Kingdom with some recognized firm of Civil Engineers of high standing; or

(d) have passed satisfactorily through a full course of instruction at a recognized School of Engineering in the United Kingdom:

Provided that in all cases the candidate must have held charge of important works for not less than five years and must produce a certificate from his immediate superior during such employment that his conduct and work were satisfactory. The candidate must also produce evidence that his knowledge of the vernacular is such as to qualify him for employment as a District Engineer.

APPENDIX VI—continued.

District Engineers in Bengal.

District.	Class.	Grade.	Names.	Pay.
				Rs.
Bakarganj	I	1st	H. O'Brien, C.E., M.S.E.	600—25—800
Bankura	III	5th	Suresh Chandra Chatarji, B.C.E.	250—10—300
Birbhum	III	5th	Saradindu Roy, B.E.	250—10—300
Bogra	III	5th	Purna Chandra Bhattacharji, M.A., B.E.	250—10—300
Burdwan	I	2nd	Jatindra Nath Mullick, B.E.	500—20—600
Chittagong	I	1st	F. H. Hodgkins	600—25—800
Chittagong Hill Tracts			G. A. Bell	200—300
Dacca	I	1st	R. B. McCormack, C.E., C.H.	600—25—800
Dinajpur	I	2nd	Jamini Kanta Sen Gupta, B.E.	500—20—600
Faridpur	II	4th	Nani Gopal Mukharji	400—20—500
Hooghly	II	3rd	Sukhendra Nath Ghosh, F.A., B.Sc. (Glasgow), M.R. SAN. I. (London)	400—20—500
Howrah	III	5th	Gyanendra Nath Ganguli, L.E.	350
Jalpaiguri	I	2nd	A. D. Hickley	600
Jessore	II	4th	Kshiti Nath Ghosh, B.A., B.E.	300—20—400
Khulna	II	4th	Rasik Lal Hul, B.A., B.E.	400—20—500
Malda	III	5th	Surendra Nath Banarji, B.A., B.E.	250—10—300
Midnapore	I	2nd	N. N. Bose, A.M.I.C.E., M.R.S.I.	500—20—600
Murshidabad	II	4th	L. C. Sen Gupta, B.E.	300—20—400
Mymensingh	I	1st	R. K. Coxo	600—25—800
Nadia	III	5th	Saish Chandra Chatarji, B.E.	400
Naokhali	II	4th	Aswini Kumar Sen	300—20—400
Pabna	III	5th	J. K. Dass Gupta, B.Sc. (Glasgow), A.M.I.C.E., A.M.I., MECH. E.	250—10—300
Rajshahi	II	3rd	Prankumar Gupta	500
Rangpur	I	1st	S. K. Dutta, B.Sc. (Vict.), C.E., M.S.E.	625
Tippera	II	4th	Pyari Charan Gupta, L.E.	300—20—400
24 Parganas	I	1st	Karuna Kumar Dutta Gupta, M.A., B.E.	600—25—800

All districts in which the Local Self-Government Act is in force are divided into three classes—

Class.	Grade	Rs.
I	1st	600—25—800
I	2nd	500—20—600
II	3rd	400—20—500
II	4th	300—20—400
III	5th	250—10—300

ANNEXURE C.

Note by the Chief Engineer explaining the existing organization and methods followed in the execution of works in Bengal.

1. The memorandum prepared by the Government of India gives full information of a general character on the organization and procedure of the Buildings and Roads Branch of the Public Works Department in India. The following note therefore deals only with the existing organization and methods of the Public Works Department in the Buildings and Roads Branch in Bengal.

2. Existing organization.—A tabular statement (No. I) has been prepared showing the number of Imperial and Provincial officers now employed in the province. The superior staff of the Irrigation Department are entered in bold type.

The sanctioned cadre is 49 officers, viz. —

Chief Engineers	2
Superintending Engineers	5
Executive Engineers	22
Assistant Engineers	20
TOTAL	49

Of the Executive Engineers, two hold the posts of Under-Secretary, one in the Roads and Buildings Branch and one in the Irrigation Branch. Of the Assistants, one is employed under the Sanitary Engineer's Department and one under the District Board of Burdwan as District Engineer.

Superintending Engineers perform the duties of Inspectors of Local Works under the Bengal Local Self-Government Act, III of 1885. In addition to the above regular establishment, the following special officers are employed whose salaries and those of their establishment are charged against the provision for establishment made in the yearly Public Works Department Budget:—

- Sanitary Engineer and two assistants.
- Electric Inspector.
- Electrical Engineer.
- Consulting Architect and two assistants.
- Plumbing Expert.
- Superintendent of Governor's Estates.

All sanitation work is done under the administration of the General Department, and such work is carried out under the supervision of the Sanitary Engineer and his establishment. The Public Works Department has no connection with such work except in the rare cases when a work of this class is entrusted to them. In such a case the work is treated as a contribution work.

The Electric Inspector carries out the duties necessary under the Electricity Act, IX of 1910. He also acts as adviser to the Local Government when advice is required on proposals for electrical installations outside Calcutta. He is not otherwise concerned with work carried on by the Public Works Department.

The other special officers are intimately connected with the preparation and construction of projects undertaken by the department and form an integral part of the department.

There are five circles consisting of 16 divisions, containing 65 sub-divisions. Sub-divisions are nearly all held by members of the Upper Subordinate Service. Statement No. II shows the constitution of the circles and divisions and the extent of each.

3. The Buildings and Roads Branch deals with all matters connected with buildings and roads only, but there are very few roads in charge of the Public Works Department. Certain buildings and roads are under the charge of divisions which are considered to be "Irrigation Divisions." For the supervision of work on such the Irrigation Department is credited with 18 per cent. of the outlay on the works.

4. Method employed in the execution of works.—The procedure to be followed before the construction of a work is commenced, and the various rules on the subject are detailed in Chapter VII of Volume I, Public Works Department Code, and summarised in the Government of India memorandum. On receipt of final or technical sanction to an original work, the Executive Engineer invites tenders for the work either through the medium of the press in the case of important works or from well-known contractors. In the case of works of minor importance, the work is given out to local contractors, a list of whom in Calcutta is kept by each Executive Engineer. In the *mufassal*, notices inviting tenders for such works are put up in the local courts or in the offices of local bodies. A similar procedure is followed in the case of repairs. All works are then carried out through contractors and none by actual departmental agency.

To ensure that only the best materials are used on works, bricks are in many instances manufactured by

APPENDIX VI—continued.

contractors for the department and issued to the building contractor. In Calcutta there is a Government brickfield, in which bricks are manufactured under contract allowing for a large reserve to be kept in order to be prepared to commence work immediately a work is sanctioned. The department also, in the past, largely obtained steel joists and sections from England. By these means it has been possible to keep rates down. Statement No. III shows the total outlay incurred on works and on establishment and the percentage of the cost of the establishment to the outlay incurred during the period 1906 to 1916.

5. *Conditions under which work is done.*—In Calcutta there is no difficulty in obtaining suitable contractors,

but in the *mufassal* there is the greatest difficulty in many places. Local labour, especially in Eastern Bengal is not obtainable, and contractors have to depend on imported labour. In Eastern Bengal communications, except by water, are either non-existent or very inefficient, so that carriage of materials is difficult. The execution of work under such conditions requires constant and close supervision and is necessarily more expensive than in large towns, such as Calcutta, Dacca and Chittagong.

H. H. GREEN.

Accompaniments.

Three statements.

STATEMENT No. I.

Statement showing the constitution of the Public Works Department, Bengal.

APPOINTMENT.	Sanctioned scale.	IMPERIAL.		PROVINCIAL.		Roads and Buildings.	Irrigation.
		Europeans from England.	From Indian Colleges.	From Indian Colleges.	Promoted Upper Subordinates.		
Chief Engineer	2	2	..	..	..	1	1
Superintending Engineers	5	5*	2 (offg.)	..	..	3	2
Executive Engineers	22	12	7	3	1	15	8
Assistant „	20	10†	..	6	3‡	11	7
TOTAL	49	29	7	9	4	30	18
Upper Subordinates	71	..	..	71	..	48	23
Lower „	153	..	..	153	..	73	80
TOTAL	224	..	..	224	..	121	103
GRAND TOTAL	273	29	7	233	4	151	121

* One Armenian.

† Includes Mr. Subarwal.

‡ One seconded.

STATEMENT No. II.

Distribution list of Public Works Circles in Bengal.

CIRCLE.	DIVISION.		
	Name.	Area in square miles.	Number of sub-divisions.
1	2	3	4
Presidency	First Calcutta	Presidency town of Calcutta.	3
	Second „	Presidency town of Calcutta, including Alipore and Barrackpore.	5
	Third „	Presidency town of Calcutta including Howrah.	3
	Electrical . . . . .	.....	3 Under an Electrical Engineer.
Northern	Darjeeling	1,164	4
	Jalpaiguri	7,750	4
	Rajshahi	8,415	4
	Duars Road	1,906	3 Construction.
Eastern	Dacca	19,182	3
	Chittagong	6,635	3
	Bakarganj	7,218	2
	Chittagong Hill Tracts	5,138	Under a District Engineer.
Central „	Burdwan	11,177	6
	Nadia Rivers	12,301	7
South-Western.	Cossye	6,884	6
	Northern Drainage and Embankment.	10,985	4
	Circular and Eastern Canals	19,752	5

APPENDIX VI—concluded.

STATEMENT No. III.

Statement showing the percentage of outlay on establishment to the outlay incurred on all works carried out by such establishment in Bengal during the years 1906-07 to 1915-16, inclusive.

YEAR.	Outlay on works and repairs.	COST OF ESTABLISHMENT AS IN SCHEDULE C OF THE FINANCE ACCOUNTS OF THE YEAR PREPARED BY ACCOUNTANT-GENERAL, BENGAL, EXCLUDING ACCOUNTS, SANITARY ENGINEER AND ELECTRIC INSPECTOR.								REMARKS.
		Direction.	Per-cent- age.	Construc- tion.	Per-cent- age.	Total of columns 3 and 5.	Per-cent- age.	Tools and plant.	Per-cent- age.	
1	2	3	4	5	6	7	8	9	10	11
	Rs.	Rs.		Rs.		Rs.		Rs.		
1906-07	82,02,409	3,28,107	4-00	8,19,077	9-98	11,47,184	13-98	1,60,033	1-95	} Including Military Works.
1907-08	83,07,576	3,38,713	4-07	9,28,753	11-18	12,67,466	15-25	88,458	1-06	
1908-09	84,82,872	3,74,611	5-79	8,60,375	13-31	12,34,983	19-10	97,526	1-50	
1909-10	50,78,647	3,98,510	7-85	7,90,070	15-56	11,88,580	23-41	46,417	-91	
1910-11	55,62,961	3,31,238	5-95	6,87,924	12-37	10,19,162	18-32	77,310	1-38	
1911-12	65,77,231	3,13,053	4-75	8,39,749	12-77	11,52,802	17-52	63,161	-96	
1912-13	67,21,700	3,14,121	4-67	8,27,091	12-30	11,41,212	16-97	66,598	-99	
1913-14	89,60,403	3,31,990	4-12	8,08,770	10-03	11,40,760	14-15	1,01,856	1-26	
1914-15	98,04,137	3,50,529	3-57	8,89,899	9-08	12,40,428	12-65	1,44,076	1-47	
1915-16	63,48,393	3,57,346	5-63	8,92,963	14-06	12,50,309	19-69	80,777	1-27	
TOTAL	7,11,23,329	34,38,218	4-83	83,44,671	11-73	1,17,82,889	16-56	9,26,212	1-30	

APPENDIX VII.

Memorandum prepared by the Government of Madras.

The Government of India have furnished with their letter No. 555-E.A., dated 15th November 1916, copies of a draft resolution and of despatches to and from the Secretary of State relating to the execution of Civil Works in British India, and have requested that a memorandum embodying the views of the local Government on the points referred to may be forwarded to the Committee by the middle of December. With a subsequent letter, No. 588-E.A., dated 29th November 1916, a revised resolution bearing No. 06-E.A., dated 24th November 1916, was received, and ordered to be substituted for the original draft resolution. In the following paragraphs, only the revised resolution is referred to.

2. Before dealing with the specific points referred to in paragraph 2 of the resolution, His Excellency the Governor in Council would make the following preliminary remarks.

3. The proposed reorganization is to be confined to the Buildings and Roads Branch, and the system under which irrigation works are at present carried out and maintained is not to be affected. Now in the Madras Presidency (as also in several other provinces of British India), there is no separation of the Engineering staff of the Public Works Department into Buildings and Roads, and Irrigation Branches, except in the case of the Chief Engineer for Irrigation and his staff in the Secretariat. The Superintending Engineers, Executive Engineers, Sub-Divisional Officers and subordinate staff all deal with the execution and maintenance both of irrigation works and of miscellaneous civil works. The Public Works Department Engineering staff could no doubt be divided into two branches (i) Irrigation and (ii) Buildings and Roads; but, so far as this Presidency is concerned, this division would involve considerable extra cost and waste of energy. A detailed estimate of the staff that would be required for irrigation works alone has been made with reference to the number and importance of the existing irrigation works. It shows that the requirements of the Irrigation Branch would be, besides the Chief Engineer, at least 4 circles, 24 divisions, 62 sub-divisions and 141 sections. A staff (suitably graded and providing for absentees) to man these charges would cost 19-81 lakhs, or say 20 lakhs as compared with the present total staff costing 34-29 lakhs, exclusive in each case of the contribution from irrigation revenue, which at present amounts to 9-4 lakhs. This estimate

of 20 lakhs provides for only four Superintending Engineers, whereas five may more probably be required. However whether the number be 4 or 5, there would be left for the supervision of all Civil Works only 3 or 2 Superintending Engineers (as the case may be), a number certainly inadequate. In regard to Executive Engineers, the number of those employed on the large delta systems could not be reduced, even if works other than irrigation were taken away from them; and it follows that *additional* officers for these other works would have to be appointed. The same result would follow in all other grades of the service. In non-deltaic areas also any division of the staff as suggested would lead to extra cost, in consequence of the scattered nature of the works, both Irrigation and Buildings, in this Presidency; so that the present system of giving an officer charge of all public works in his division is more economical both of men and money than any scheme of water-tight sub-departments. Any such change would also lead to waste of energy, in that two officers instead of one would be covering the same ground. An irrigation officer would have no concern with buildings and other civil works that may lie in the neighbourhood of his irrigation works; while the officer in charge of buildings in the same area would do no inspection of irrigation works. The fact that the proposal is not to create a separate Buildings and Roads Branch, but to hand over the works of that branch to other agencies, does not affect the argument; for the new agencies, assuming that they could be found, would doubtless charge Government for the efficient supervision of buildings and roads works a considerable sum, which could hardly be less than the cost of maintaining a separate Buildings and Roads Branch. The extra expense would presumably fall in great measure on Provincial funds, which could not afford it. His Excellency in Council therefore considers the proposal to reorganise the Buildings and Roads Branch alone, in the manner proposed, leaving out of account the Irrigation Branch, to be unsuitable and unsound as regards this Presidency.

4. Moreover, several of the evils which the Government of India seek to remove have no application to the conditions obtaining in this Presidency. For example, in paragraph 9 of their despatch to the Secretary of State, the Government of India suggest the reorganization of the Buildings and Roads Branch with

APPENDIX VII—continued.

a view to the execution of work entirely paid for by local bodies being arranged for by the local bodies concerned. This is what already obtains in Madras both in the case of Municipalities and of District and Taluk Boards, except in the case of very large and important works. Again, it is suggested in the same paragraph that, after the proposed reorganisation, contribution works such as non-Government school buildings, hospitals and dispensaries for which Government give a grant, village and small urban sanitation schemes carried out partly or wholly from Government funds, might be designed and carried out by private practitioners. This is also what is already being done in this Presidency; and if the Public Works Department had to deal with all such petty works (as presumably must be the case in some other provinces that the Government of India had in mind when drawing up the despatch) an increased establishment would be necessary. In all cases where a Government grant is given, the designs are first passed by a Government officer as suitable, as suggested by the Government of India. In the above respects no reorganisation is necessary in this Presidency.

5. Coming now to the particular points referred to in paragraph 2 of the Government of India Resolution, clause (i) asks whether the methods at present adopted for the execution of civil works are economical and suitable for the purpose for which they were devised. As regard *economy*, His Excellency in Council considers that the methods at present adopted are suitable, and that any such change as that contemplated by the Government of India must result in greater expenditure for the same class of work or in inferior work for the same outlay. The question whether the actual rates for works (on which schedule rates are based) are not themselves unduly high has recently been examined more than once. The Government of India raised the question in 1912 and Mr. S. D. Pears,*

Vide papers with letter 419 A.W., 21st February 1914.

*Late Chief Engineer, Public Works Department.

was deputed specially to investigate the matter. The investigation showed that there was nothing extravagant or unreasonable in the building practice in this Presidency; that the cheaper kinds of materials, such as brick-in-mud, country wood, etc., were being used for minor buildings; and that estimates prepared by non-government agency for educational buildings, which came before the Chief Engineer for scrutiny, showed that the rates allowed in those estimates were very much the same as those which obtained in the Public Works Department. Sundry cases where the cost of construction by a private body seemed to be markedly low have also been investigated from time to time. For instance, a Mission Church at — had been erected at an exceptionally low cost; but upon enquiry it was found that the building was structurally unsound owing to insufficient foundations, that almost all the materials used, concrete, sand, stone and wood, were of very inferior quality, and that the mission had found it possible to engage *coolies* for this work at a very low rate. A comparison between the schedules of rates of the Public Works Department and of the Southern Mahratta Railway Company was also made in December and January last, and it was found that the Public Works Department rates compared favourably with the railway rates. The Committee will perhaps have data which will enable some comparison of Madras rates with those of other provinces to be made; but it will obviously be difficult to differentiate between higher rates due to unsuitable or uneconomical methods, and those due to higher market rates for materials or other conditions beyond control. In 1907, the Government of India stated—*vide* letter from the Government of India No. 985 B., dated 27th June 1907—that the Madras rates for buildings were low compared with those of other provinces, and there are no grounds for supposing that the relative position has changed since then. Another indication that Madras Public Works Department rates are not uneconomical is afforded by the fact that big engineering firms have not been attracted to Madras, by the prospect of large profits to be made.

6. As regards the cost of superior supervision not charged to works, represented by the salaries, travelling allowances, etc., of the regular establishment ranging from the sub-overseer up to the Chief Engineer, there is probably room for difference of opinion. The Government of India seem to consider that there might be more economy, and that simple and unimportant works which are now undertaken and supervised by highly salaried officers of Government could, if private agency were available, be carried out at reduced cost under contract by that agency, subject to the supervision of Inspectors. It may, however, be observed that the Public Works officers have always aimed at the gradual extension of the system of regular contracts to the fullest possible extent, as by so doing the accounts kept by disbursing officers are shortened and simplified. But the so-called "contractors" in this Presidency, with possibly one or two exceptions in the Presidency town, are little more than providers of labour and suppliers of materials. Their work requires close supervision, and they have to be instructed at every stage. A large number of Government *maistries* and subordinates are therefore necessary, and the work of these men themselves requires close supervision, as mentioned in paragraph 7 of the Government of India letter to the Secretary of State. Accounting is also more than ordinarily complicated, owing to the contractors being mostly comparatively poor men with small capital, who require to be paid frequently to keep them going. The administrative duties incidental to a large department are also responsible and heavy. Under the circumstances it does not appear that there is redundant supervision or that effective supervision could be secured with a lesser number of officers.

7. The present methods, which are the outcome of gradual development and long experience, have been found to be quite suitable for the execution and maintenance of Government works.

8. In clause (ii) of their Resolution the Government of India enquire whether under the existing system private enterprise is sufficiently encouraged. His Excellency the Governor in Council considers that private enterprise is given every opportunity of undertaking contracts, but that large contractors are probably deterred from entering on the field by the fact that Madras rates are not sufficiently tempting. Tenders are invited for most works, large and small, and suitable contractors are always welcome; but contractors, properly so termed, that is to say firms or individuals having their own technical staff and plant, and competent to work from plans and specifications without constant guidance from Public Works officers and subordinates, are practically non-existent in this Presidency. The great majority of Madras contractors are merely petty piece-workers with a moderate command of capital and labour and no professional qualifications. The absence of large contractors may of course be partly due to the presence of the Public Works Department, but works carried out by them, would in the opinion of this Government cost considerably more than under the present system. Private Civil Engineering enterprise and larger contractors are not likely to be attracted to this Presidency unless the rates for work are increased with this specific object. Such increase of rates would have to be substantial, say, 15 to 20 per cent. and even then the desired result is not likely to be obtained for many years, during which period an unnecessary addition will be made to the profits of existing contractors, or of the money-lenders who finance them. With increased rates, it is possible that in the course of years qualified men or firms may set up in this Presidency, with their own Engineering staff and their own plant and workshops, but there is no sign of such a result under existing conditions, and it seems premature to consider radical changes in organisation that depend essentially upon the establishment of such a class of contractors. As already mentioned the first and most important step necessary for attainment of the desired end will be to increase all rates and make the execution of contract works more profitable than at present. The next step

APPENDIX VII—continued.

will be to discourage small contractors by grouping works as far as possible into large contracts, by withholding the financial assistance now given to small piece-workers (by frequent payments on account, for example), by requiring more rapid execution under heavy penalty, and perhaps by insisting upon the provision and use of plant and machinery that no small contractor could afford to obtain.

Against these increased charges, the only set-off would be the savings due to any reduction of the Public Works Department staff that it might be found possible to effect.

9. In the second portion of clause (ii) of their resolution, the Government of India direct enquiry as to whether it is possible and desirable to entrust the construction and upkeep of certain classes of Public Works to agency other than departmental, and, if so, upon what lines such change should be effected. The only agency available at present is the Local Fund Engineering establishment; but this establishment would have to be very largely increased, if it were to take over any appreciable number of Public Works, seeing that, as a general rule, the time of the District Board Engineering staff is so fully occupied with their legitimate duties that employment on Government work would very seldom be practicable. Local boards certainly would not provide from their own funds for this increased staff, and the cost would have to be met by Government. Moreover there would probably be constant trouble and delay due to the Engineers having to carry out ordinary Government works in addition to works for the local bodies under whom they were serving. Local boards would not favour the change, as they would lose their present full control over the District Board Engineer and his staff, and would be apprehensive that he might give undue preference to Government works, to the detriment of local fund works. From the District Board Engineer's point of view also, the position would be unsatisfactory, as he would have to serve two masters. For the above reasons, this Government considers it undesirable to entrust the execution of Government works to the local boards' engineering staff.

There is, however, no objection to local boards being required to carry out buildings and bridges with their own agency to a larger extent than hitherto. The preparation of schemes for major sanitary works is a matter which requires special training and which cannot at present be undertaken by the engineering staff of local bodies. But this designing work is now ordinarily done by the Sanitary Engineer and his subordinates, and the execution of the sanctioned schemes might more frequently be entrusted in the case of rural areas to the agency employed by local boards. The major sanitary schemes, however, have generally to be carried out in municipal areas by the Public Works Department as the prospects of municipal service are not sufficiently tempting to attract men of the same calibre and qualifications as in the local fund service. Municipalities would have to employ in such cases special temporary engineers, if the execution is no longer to be entrusted to the Public Works Department.

In this connection, it may be noted that the observations of the Government of India in paragraph 9 of their letter to the Secretary of State regarding the qualifications of the engineering staff of local bodies, have no application to this Presidency. Several District Board Engineers who are Indians have been promoted from the rank of Assistant Engineer in the local fund service, and are men with high professional qualifications, belonging to the same class from which Executive Engineers of the Provincial branch of the Public Works Department are recruited.

10. The question whether the Public Works Department meets the needs of other departments of the administration, raised in clause (iv) of the resolution, is being investigated; but so far as information has been received the needs of other departments appear to be fully and satisfactorily met. As regards the second portion of paragraph 2 (iv) of the resolution it is considered that the relations *inter se* of the various sub-

divisions of the Buildings and Roads Branch are satisfactory. The Sanitary Engineer, Consulting Architect and Electrical Inspector to Government, are in this Presidency all technical assistants to the Chief Engineer, Buildings and Roads Branch, and have no executive duties.

11. *Clause (v) of the Resolution.*—The question of further decentralisation within the Public Works Department itself may be considered under three different heads:—

- (1) powers of technical sanction to detailed estimates,
- (2) powers to enter into contract agreements, and
- (3) powers to reappropriate funds.

As regards (1) Superintending Engineers have powers of technical sanction of original works up to Rs. 20,000 generally and to Rs. 50,000 in certain cases, while under "Repairs" there is no limit imposed. These powers of technical sanction are considered sufficient. Executive Engineers as a class are authorised to accord technical sanction to detailed estimates for original works, or special repairs not exceeding Rs. 200, while certain selected officers exercise such powers up to Rs. 500, and others up to Rs. 1,000. Under ordinary repairs, all Executive Engineers can exercise such powers up to Rs. 200 and selected officers within the limit of budget allotments; but in the case of buildings a further limit is imposed of 2 per cent. on the capital cost of each building, and in the case of roads to a sum per mile fixed by the Superintending Engineer. Executive Engineers have, however, no powers of administrative sanction, and it is under consideration whether this class of officers may not be granted these powers up to a certain limit, and increased powers of technical sanction.

12. *Powers to enter into contract agreements.*—These powers are governed by paragraph 757 of the Public Works Department Code. Superintending Engineers may accept tenders up to the limit of their powers of technical sanction (Rs. 20,000 or Rs. 50,000 as the case may be) and Executive Engineers up to Rs. 5,000. These powers are considered sufficient.

13. *Powers to reappropriate funds from one work to another.*—This is a question more of administration than of execution, and it is held undesirable to delegate to Superintending Engineers any greater powers than they at present possess.

14. *Clause (vi) of the Resolution.*—The provisions of the Public Works Department Code are in some respects unduly restrictive, but this is more with regard to accounts audit than to actual execution. There has not been time to obtain full particulars from officers of the department, but the officers selected to give oral evidence before the Committee are being asked to give details in their written memoranda. It seems absurd, for example, that an Executive Engineer should have to obtain the sanction of the Superintending Engineer (*vide* paragraph 908 of the Public Works Department Code), to auction a temporary shed put up during the construction of a new work, which has to be removed when clearing the site. As regards the actual execution and maintenance of civil works the Code, if interpreted by audit officers in a reasonably liberal spirit, does not appear to be unduly restrictive.

15. As regards clause (vii) of the resolution, a note by Mr. James, Principal of the Madras Engineering College, on the system of education in that college is attached* and his conclusions are accepted by this Government. As pointed out by him it does not appear that any alteration in the system of engineering education at the Madras college would have the effect of attracting a different or a superior class of students. We already get students of average ability, and if we want the very best they must be attracted by the prospects of an improved career, which of course connotes higher pay for those who take up appointments under Government, under local bodies, and higher rates for work, so as to provide increased profits, for those who may take up the profession of engineering contractors. This increased

* Annexure A.

APPENDIX VII—continued.

outlay on civil works of all kinds would probably have to be continued for many years before having any permanent effect, and it is hardly likely that the eventual saving in Public Works Department establishment charges would compensate for it. The position in this country is, moreover, entirely different from that in England. There the youngster starts from the bottom and rises by sheer merit; if he has no merit, he remains in the subordinate ranks for the whole of his life. Here in India the young Indiaa thinks manual labour beneath his dignity, and commences his study of engineering with his college training. On completing that training he is put into a position of considerable trust before his superiors can judge of his capacity for the work. If private firms come into the field, they will have to take their Indian assistants from the same class and are likely to treat the failures with much less compunction than Government do. The probable effect on Indian public sentiment deserves consideration.

16. As regards provision for practical training on works referred to in clause (viii) of the resolution, adequate provision is made for the practical training on works of students who have passed through the Madras College of Engineering, and they are required to complete satisfactorily a year's course of practical training before receiving the college diploma. During this practical training they receive subsistence allowance. Provision is also made for practical training at (1) the Railway Workshops at Perambur, (2) the Electric Supply Corporation, (3) the Madras Harbour Works and (4) the Madras Water-supply and Drainage Works. In the case of (1) and (2) the premium payable is Rs. 250 per student for the one year's course, and in the case of (3) and (4) Rs. 200. The premia are paid by the students themselves in the first instance, but 50 per cent. thereof is refunded to them if the reports of their progress while under training are satisfactory. No fees are charged for any training under the Public Works Department. There is no provision at present made for the practical training of students who have received their scientific education in English colleges but as the number of such students will always be limited, there would be little difficulty in arranging for their training on public works. A similar question was referred to this Government by the Government of India in November 1913 and a reply was sent in April 1914 (*vide* letter No. 834 W., dated 20th April 1914) that the Madras Government would be prepared to allow Executive Engineers to take selected Indian engineer students of English Universities, for practical training under them on payment of premia. It was suggested that Rs. 600 per annum would be a reasonable sum, and that this might be made payable in the first instance to Government, to be passed on eventually in the form of a monthly allowance to the engineer who actually gives the instruction. The Local Government considered that the demand of a premium was essential in order to ensure, on the one hand, that those who are selected, are properly looked after, and on the other that those who are not in earnest about learning their profession are kept out. They also considered that the students were hardly likely to object to the payment of the premia, since nowhere else could they get similar training without payment.

ANNEXURE A.

Note by Mr. W. H. James, B.Sc., Principal, College of Engineering, Madras.

The policy of the several Governments in regard to the Engineering Colleges under their control has, it seems to me, been influenced naturally by the needs of the country, and up to now the main object has been the provision of qualified men for Government service, but I am inclined to agree with the suggestion that the time has now come when it is advisable to consider whether the whole system of technical education, particularly in its higher branches, may not be opened out

gradually and placed on a broader basis, and this specially in so far as admissions to colleges are concerned.

In other and technically more advanced countries it is possible for any youth who desires, provided he possesses the necessary preliminary educational qualifications, to enter on a course of engineering study, but he realises he does so on his own responsibility and does not consider that the possession of a diploma places him in a position of having exceptional claim on any class of appointment and most certainly not Government service and when he gets employment, it is to start with hardly ever on a living wage.

The very different conditions in some ways that obtain in this country I need not emphasize and I assume the reason for Government placing restrictions on the number of admissions to the engineer classes has been the knowledge that appointments are not available in Government or private service for large numbers of men with high technical qualifications, an attitude that can fully be justified by the fact that roughly about half the students who pass through our Engineer course have latterly taken Upper Subordinate appointments in the Public Works Department.

If more appointments are available, it obviously follows that the number of admissions may be increased but the country is far from ripe for doing away altogether with restrictions of this kind, though the normal line of progress points in that direction.

With reference to educational matters in particular the statements are made that—

(a) the better class of Indians is not attracted to Civil Engineering as a profession;

(b) the foregoing is due possibly to the system of education in Government Colleges not being organized on a sufficiently broad basis;

(c) the system further is inadequate possibly to provide qualified engineers to whom works could be entrusted by local bodies, etc.;

and I offer a few remarks on these "*seriatim*."

(a). A great deal depends on what precise meaning is to be attached to the description "better class," but in any case I do not think the statement can be accepted without qualification in so far as it applies to this Presidency. Our Engineer students come from much the same classes as, and intellectually are at least on a par with, the average of those who enter ordinary Government employ or join the Law College, but until the time when engineering as a career can offer prizes comparable to those that are to be gained in the practice of law, it must be the case that the great majority of the best and most promising students of the University will aim at joining the legal profession. The very limited prospects of remunerative employment must have deterred many an ambitious and able youth from entering the Engineering profession.

(b). This possibly has reference to the rules governing admission to and prosecution of the courses being somewhat rigid, but much freedom in this connection is impossible when a college diploma is regarded as a guarantee that the holder can be relied on as qualified in definite respects. In my experience further, there have been no demands from students worth considering for anything but a complete course but this I admit it is quite possible may be due to their knowledge of what is admissible under the rules.

I do not think that restrictions compelling students to take particular and specified courses have in any way affected the class of student attached to the college. Better the prospects of students after completing a course and the standard of the student desiring admission is at once raised correspondingly!

(c). This institution can and does train men fully qualified to take in hand works of the kind under consideration, so far as that is possible in a college. For architectural training there is no provision. Apart from the obvious advantage we have of familiarity with Indian conditions, materials, methods of working and requirements, I have no hesitation in saying that the standard on the theoretical side here in Civil Engineering is quite up to the level of colleges in Great Britain, as

APPENDIX VII—continued.

can amply be evidenced by a perusal of the syllabuses of the courses of instruction, time tables, and papers set in College and University Examinations.

The inadequacy of our provision for laboratory work has long been fully appreciated by Government and we shall have all that is wanted at Guindy.

The steps taken by Government in connection with the development and improvement of the efficiency of the college are all clearly set forth in the various Government Orders relating to the institution.

For the purposes of the memorandum perhaps, it will be convenient to deal with matters under the following heads :—

- (a). Courses of instruction.
- (b). Staff.
- (c). Accommodation and equipment.

Courses of instruction.—These were fully considered by the committee which was appointed in G.O. No. 723, Educational, dated 12th December 1904, "to consider the revision of studies and the curriculum," and on whose report final orders were passed in G.O. No. 657, Educational, dated 10th October 1906. From that and the previous connected G.O. No. 655, Educational, dated 3rd October 1905, it will be seen that very radical changes were made, and of considerable importance was the institution of separate courses for Civil and Mechanical Engineering, the latter covering also some instruction in Electrical Engineering.

Important modifications since introduced have reference chiefly to the formation of the Probationary Subordinate class, the change in the general education standard for admission, and the increase in the duration of the Engineer and Upper Subordinate courses from three to four years, regarding which reference may be made to G.O. No. 451, Educational, dated 8th July 1911.

An important feature of our courses is the attention devoted to and the stress laid on practical training in drawing office, laboratory and field, and this, apart from its inherent value as a method of teaching, is very necessary owing to the somewhat considerable demands made on young students completing the training directly they enter employment, which are greater than is usually the case in other countries.

Referring more particularly to the courses for the Engineer classes, the underlying idea of the committee was to provide a thorough grounding in general Engineering science on which afterwards could be based any desired specialisation. It should be appreciated that the majority of the students come to the college, for no fault of their own, with little or no notion of engineering, and the difference in this respect should not be lost sight of in connection with proposals for specialized courses based on what is being done in other countries under conditions which in other cognate matters also are very dissimilar.

It may be pointed out that these syllabuses were very carefully considered comparatively recently by the University Board of Studies in Engineering—a body of engineers familiar and closely in touch with the theory and practice of engineering both in this country and in Europe—and on their recommendation were adopted

practically in their entirety by the Senate at its meeting on November 18th, 1914, for incorporation in the revised regulations for the B.E. degree, which come into force next year for the University examinations.

A student after taking the college diploma is for the rest of his career as an engineer in much the position of post-graduate student, and after his training in both arts and professional colleges, should find no insuperable difficulty in taking up the study of and adapting himself for specialized work. It is conceded, however, that the provision of courses dealing with specialized branches of engineering practice might be of considerable assistance, and proposals in this connection were made by the committee whose recommendations are recorded in G.O. No. 1224, Education, dated 2nd November 1914, on the

lines of which it is hoped something will be done when we move to Guindy.

Developments in future should, in my opinion, proceed in the direction of providing such specialized courses. The rules governing admission to the courses, while not encouraging students to depart from the sound policy of getting a thorough initial grounding in the elements of engineering and the connected sciences, should be sufficiently elastic to permit of the attendance of persons who may not be qualified by the possession of a diploma, but whose desire is to gain what knowledge they can by taking the course.

Electrical engineering will later on call for more attention but just at present the post-collegiate course which the college can now offer seems to me sufficient. A sound and thorough training in mechanical engineering is in any case absolutely essential as a preliminary to entering on advanced studies in electrical engineering, and the demand for the highly trained electrical engineer being very small in this country, what ordinary appointments are available can very well be filled by our mechanical engineering students, who devote a fair portion of their time to electrical engineering.

Staff.—It is hardly necessary to remark that syllabuses of courses of study may mean much or comparatively little: what is of vital importance is the manner they are dealt with, in other words, the teaching agency.

It is a truism that it is impossible to turn out an engineer by only college training. The most that can be attempted is to give a sound groundwork of knowledge based on which experience of actual work will enable the young engineer to attain a fair measure of professional skill.

It is, however, essential, in view of what is demanded of students when they leave, to carry on their training in as close relation to practical conditions as possible, and one way of effecting this is to have practical men as their teachers. This end was to a very considerable extent achieved by the decision of Government, G.O. No. 414, Educational, dated 29th June 1911, and G.O. No. 55 W., dated 12th January 1912, that the staff of the College other than the Principal and Professors should be supplied from the cadre of the Public Works Department. The college junior appointments are accordingly now filled by sub-engineers, supervisors and overseers of the Public Works Department, and as our principle ordinarily is to retain no subordinate more than about three years, we have a staff always fresh from contact with actual work.

With the progressive increase in the number of students, Government have added to the number of assistants from time to time, and now we have twenty as compared with twelve less than ten years ago.

The most important addition to the staff within recent years was the appointment last year of a Professor of Electrical Engineering together with an Electrical Laboratory Assistant, G.O. No. 1052, Educational, dated 24th September 1915, which has greatly improved the efficiency of that department of college work and has made it possible for the Professor of Mechanical Engineering to devote his whole time to his particular branch of engineering.

The staff we have at present is adequate for the conduct of the classes under our existing arrangements, which mean that the whole time of the professors is taken up with direct teaching work, but on the transfer to Guindy and the provision there of adequate laboratory equipment, it will be expected that they will take advantage of the facilities afforded to undertake investigational work of a varied nature. If anything of this sort is to be possible, and its importance and necessity hardly needs emphasizing, it will be essential to have another professor to take over part of the work of the civil engineering department, and to make a new appointment of Professor of Engineering Chemistry.

For specialized courses, outside engineers with the necessary special experience must to a considerable extent be relied on, if the courses are to serve a really useful purpose.

Accommodation and Equipment.—The inadequacy of our laboratory accommodation and equipment was

APPENDIX VII—concluded.

recognized by Government as far back as 1906 (G.O. No. 657, Educational, dated 10th October 1906, page 6, paragraph 2), when it was decided that plans and estimates should be prepared for new buildings to be located at Saidapet. Some time afterwards there were further developments based on proposals emanating in the first place from the Ootacamund Industrial Conference of September 1908, the acceptance of which in principle meant a substantial advance on what was intended at Saidapet and calling for more space than that site provided. It was finally decided to locate the new college

at Guindy (G.O. No. 132, Educational, dated 8th March 1909) and plans worked out in detail for that site were finally approved and work commenced in 1914.

The estimate of expenditure comes to about Rs. 17,75,000 and a note giving a fairly full description of what is intended goes with G.O. No. 1878 W., dated 23rd September 1913, from which can be taken what is required. If detailed figures of cost are quoted, some revision may be called for in connection with the estimate for the power house in view of the larger scheme now being prepared in the Public Works Department.

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